RAILROAD GAZETTE

SATURDAY, JANUARY 24, 1874.

Contributions.

The Fireless Locomotive.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In New Orleans, cars drawn by locomotives without fire are in regular use, the reservoirs that furnish steam for the engines being charged at intervals with water of a high temperature. This arrangement was patented by Dr. Emile Lamm, of New Orleans, about a year and a half ago. The claims made by him in his patent papers will give a general idea of what he proposed to accomplish:

"1. The process of furnishing a supply of steam to the water in a reservoir attached to a traveling engine, for the supply of steam thereto, by temporary connection of the reservoir with the steam-space of a stationary boiler, substantially as set forth.

"2. The combination of a perforated tube with the reservoir, as and for the purposes set forth and specified."

Dr. Lamm was a dentist by profession, and does not appear to have had any special education as an engineer, but he was strongly impressed with the necessity of producing some safe, cheap, and simple motor for the propulsion of street cars. His earlier experiments were with electricity as a motive force. The ammonia engine was next patented, and, after this, an arrangement in which the reservoir containing water was enclosed in a vessel filled with chloride of calcium at a high temperature. The idea of using hot water alone seems to have been an offshoot of this last invention.

It is evident that the fireless locomotive, if reasonably efficient, satisfies many of the conditions necessary in street car propulsion. The reservoir, not being subjected to the action of fire, is less liable to rapid deterioration. The steam pressure is always the greatest when the reservoir is being charged at a station, so that the liability to explosion during a run is much diminished, and men of ordinary intelligence can be used as engine drivers on locomotives where the steam is furnished ready for use, without any care upon their part. It must be evident, however, that this locomotive is rather bulky in comparison with one carrying coal to generate the steam. In the matter of economy, also, it is probable that the latter would excel. Still, there are many places in which the single item of having no smoke would be sufficient to call for the adoption of the fireless locomotive, if it were capable of doing the required work.

There are two of these locomotives in the vicinity of New York, and numerous accounts of their trial trips have been published. The theory of their action has not, however, been thoroughly set forth, and it may be interesting to devote some space to its consideration. The writer, in company with Mr. Henry L. Brevoort, recently made a trip with the smaller of these two locomotives, and noted down such data as were possible.

The locomotive consists of a platform set upon a four-wheeled truck, carrying a cylindrical reservoir 87 inches in diameter and 9 feet long, with a steam dome 1 foot in diameter and 2 feet high. The steam space of this reservoir is connected with a pair of vertical engines, each having a diameter of 5 inches and a stroke of 7. The engine shaft has a pinion of 26 teeth, gearing into a wheel of 46, which is secured to the axle of one pair of truck wheels. The diameter of the truck wheels is 30 inches. The reservoir is covered with cement and felting, and the steam cylinders are also heavily felted. A 2-inch pipe, perforated with small holes, runs the whole length of the reservoir, near the bottom, and steam is admitted through this pipe for the purpose of heating the water. The engines have slide-valves, and are fitted with the link-motion. The following data will be useful in the calculations:

Capacities in cubic feet.	
Cylindrical portion of boiler	64.64
Steam dome of boiler	1.55
Volume of cylinder swept through the piston per stroke	0.0786
Clearance and passages	0.0045

In making a trial trip with this locomotive, the reservoir was half-full of water, and the pressure of steam was 142 pounds per square inch at the time of starting. The changes in the steam pressure during the run are given below:

Time.	Pressure.	Time.	Pressure.
3:35	142.	4:07	66.
3:37	132.	4:10	52.
3:38	124.	4:13	48.
3:39	124.	4:15	44.
3:51	102.	4:21	29.
3:53	97.	4:24	22.
3:55	89.		
4:04	70.	Mean pressure during run.	81.5

During the trip, a sufficient number of indicator diagrams were taken to give average conditions, particulars of which, with other data noted, are here appended:

Mean total pressure in cylinders, 23.01 pounds per square inch.
Mean back pressure, 5.15.
Total time of trip, 49 minutes.
Running time, 35.5 minutes.
Average revolutions per minute, 147.4.
Distance run, 4.4 miles.

From these data, it will be easy to calculate the indicated horse power of the engines, and the amount of steam accounted for by the indicator. The diameter of the piston rods of the engine is ¾ of an inch, so that the mean area of each piston is 19.414 square inches, and the mean indicated horse power during the run is

$$\frac{2\times19.414\times17.86\times14\times147.4}{12\times33{,}000}=3.61.$$

Cubic feet of steam, at pressure of 19.86 pounds per square inch (the terminal pressure), used during run, as shown by the indicator diagrams,

$$4\times.0831\times5233=1739.4.$$

It is proper to remark, in this connection, that under favorable circumstances somewhat more steam is used by an engine than is shown by the diagrams, and in the case of leaks and other derangements very much more.

It will now be interesting to calculate how much steam the reservoir would have furnished under the most favorable conditions, and in this calculation the theory of the action will be developed in a simple manner. Evidently, the most favorable conditions that could occur would be that all the water in the reservoir, on starting, should be heated to a temperature due to the steam pressure (142 pounds per square inch), and should be saturated with an equal volume of steam of that pressure; that at the termination of the run the water should have the temperature due to a steam pressure of 22 pounds per square inch, and be saturated with an equal volume of steam at that pressure; that there should be no loss of heat from radiation or otherwise, all the heat in the water, between the limits, being used in the formation of steam.

Assuming these conditions, the mean pressure of steam during the run will be about

$$(142+22)\div2=82 \text{ pounds}$$

per square inch, and it will be sufficiently accurate to assume that all the steam furnished by the reservoir was at that pressure. In making these calculations, some data relating to the weight and temperature of steam at the different pressures* will be required.

Steam of 142 *pounds per square inch.*	
Temperature, Fahrenheit	361°.8
Temperature on the absolute scale	823.°
Total units of heat in a pound of steam	1,224.3
Weight of a cubic foot of steam	.3505
Steam of 82 *pounds per square inch.*	
Temperature, Fahrenheit	325°.2
Units of latent heat in a pound of steam	887.9
Weight of a cubic foot of steam	.2225
Steam of 22 *pounds per square inch.*	
Temperature, Fahrenheit	262°.
Total units of heat in a pound of steam	1,193.8
Weight of a cubic foot of steam	.0895
Steam of 19.86 *pounds per square inch.*	
Total units of heat in a pound of steam	1,192.8
Weight of a cubic foot of steam	.0846
Steam of 81.5 *pounds per square inch.*	
Total units of heat in a pound of steam	1,213.1
Weight of a cubic foot of steam	.2214

EXTENSION OF THE NEW YORK ELEVATED RAILROAD AT THIRTY-FOURTH STREET.

At the commencement, according to the supposition, the reservoir contained 32.32 cubic feet of water at a temperature of 361°.8, and 66.19 cubic feet of steam having a pressure due to that temperature. The weight of a cubic foot of water at that temperature can be found with sufficient accuracy by a simple approximate formula.

Let t = temperature of the water reckoned on the absolute scale,† in Fahrenheit degrees. Then the weight of a cubic foot at that temperature

$$=62.425\div\tfrac{1}{3}\left(\frac{t}{500}+\frac{500}{t}\right)$$

Applying the rule to the present case, it is found that the weight of a cubic foot of water at a temperature of 361°.8 Fahrenheit is

$$62.425\div\tfrac{1}{3}\left(\frac{823}{500}+\frac{500}{823}\right)=55.39 \text{ pounds.}$$

Hence the number of pounds of water in the boiler at the commencement is

$$32.32\times55.39=1,236.3,$$

and since each pound of water contains 361.8 units of heat, the number of units in the water is

$$1,236.3\times361.8=447,293.34.$$

A cubic foot of steam at a pressure of 142 pounds per square inch, weighs .3505 pounds, and a pound contains 1,224.3 units

* These figures are taken from an extended "Table of the Properties of Saturated Steam," now in course of preparation by the writer. The temperatures are compiled from the experiments of M. Regnault, and the weights are calculated from the formulas deduced by the late Prof. Rankine, and published in his "Treatise on the Steam Engine."

† To reduce temperatures on Fahrenheit's scale to temperatures on the absolute scale, add 461°.2.

of heat, so that the total number of units of heat in the steam at commencement is

$$66.19 \times .3505 \times 1,224.3 = 28,403.26,$$

and the units of heat in steam and water at commencement amount to

$$447,293.34 + 28,403.26 = 475,696.6.$$

At the termination, the reservoir contains 1,236.3 pounds of water, diminished by the amount that has been evaporated, at a temperature of 262°, and 66.19 cubic feet of steam, at a pressure of 22 pounds per square inch. Calling X the number of pounds of water that have been evaporated, the number of pounds remaining in the reservoir will be represented by $1,236.3 - X$. Hence the number of units of heat in the water, at termination, is

$$(1,236.3 - X) \times 262 = 323,884.4 - 262\,X.$$

Steam at a pressure of 22 pounds per square inch weighs .0895 pounds per square foot, and the number of units of heat in the steam at termination is

$$66.19 \times .0895 \times 1,193.8 = 7072.06$$

The total number of units of heat in the reservoir at termination will then be

$$323,884.4 - 262\,X + 7,072.06 = 330,956.46 - 262\,X.$$

Hence the number of units of heat used in the formation of steam is

$$475,696.6 - (330,956.46 - 262\,X) = 144,740.12 + 262\,X.$$

All the steam furnished by the reservoir is supposed to have been evaporated from water having a temperature of 262°, at a pressure of 82 pounds per square inch, so that each pound of water must have its temperature raised 325°.2 − 262 = 63°.2, and must have 887.9 units of latent heat imparted to it, or each pound of water will require an addition of 887.9 + 63.2 = 951.1 units of heat for its conversion into steam. From these data it will be easy to form an equation, from which the value of X, the number of pounds of water evaporated, can be determined.

$$\frac{144,740.12 + 262\,X}{951.1} = X$$

$$689.1\,X = 144,740.12$$

$$X = 210.04$$

These calculations have been made somewhat in detail, for the purpose of simplifying the theory. It will now be well to compare the theoretical evaporation with that accounted for by the indicator. An examination of the diagrams shows that the mean initial pressure of the steam in the cylinders was 23.52 pounds per square inch, and the mean terminal pressure, 19.86 pounds. During the run, it was found necessary to work the engines with full link, regulating the speed by means of the throttle, so that the steam was wire-drawn, and there was no expansion. As before stated, the amount of steam accounted for by the indicator was 1,739.4 cubic feet, which was exhausted at a pressure of 19.86 pounds per square inch; hence its weight was 1,739.4 × .0846 = 147.15 pounds. The difference between this and the theoretical evaporation can probably be accounted for in a satisfactory manner. It has already been remarked that the indicator does not generally show all the steam that is used in an engine, and probably an allowance of not less than 10 per cent. can be accredited to this cause. Again, it must be evident that the arrangement for charging the reservoir was not efficient enough to satisfy the theoretical conditions. Attempts were made to ascertain the temperature of the water in the reservoir, but were not very successful, on account of the imperfections in the fittings. It was shown quite satisfactorily, however, that the water in different parts of the reservoir was quite differently heated. The covering of the reservoir also afforded a very imperfect protection against the radiation of heat. It seems probable, then, that the actual evaporation was about midway between 210.04 and 147.15 pounds, the amounts determined by theory and experiment respectively.

It will probably be a matter of surprise to many that the working pressure of steam in the reservoir was so rapidly exhausted, and it may not be amiss to search for the reasons. An evaporation of 147.15 pounds of water in 35.5 minutes is equivalent to an evaporation per hour of (147.15 × 60) ÷ 35.5 = 248.71 pounds. This would show that the engines required, for each indicated horse-power per hour, an evaporation of

248.71 ÷ 3.61 = 68.9 pounds of water, or
68.9 ÷ 62.425 = 1 1-10 cubic feet.

In the time of James Watt, the evaporation of one cubic foot of water per hour was considered an ample allowance for the production of a horse-power in an engine; and at present, somewhat less than half that amount is generally deemed sufficient. The use of so much steam per horse-power in these engines is evidence of bad design or improper management. Some little space will be devoted to a consideration of these questions.

Referring to the data recorded above, it appears that the mean back pressure was (5.15 × 100) ÷ 23.01 = 22.38 per cent. of the total mean pressure in the cylinders. It has been shown, both by experiment and in the practice of skillful engine builders, that the mean back pressure against the piston in a non-condensing engine can be reduced to less than half a pound per square inch, with proper proportions and arrangement of the exhaust passages. By far the greatest waste occurred, however, from wire-drawing the steam, instead of allowing it to expand in the cylinder, to produce the required mean pressure. It must be obvious that in using steam of varying pressure, as occurs in the present case, it would be most economical to have an efficient cut-off, with automatic adjustment. The performance of the engine under these conditions can readily be compared with the case in which the steam is wire-drawn. The two cases to be considered are as follows:

1st. That the steam, having an initial pressure of 81.5 pounds per square inch, is cut off in the cylinder at such a point that the mean pressure shall be 23.01. (It is evident that this represents average conditions, the initial pressure of the steam being higher than this for a portion of the time, and lower for the remainder of the run.)

2d. That steam of 81.5 pounds per square inch is wire-drawn, or allowed to expand without doing any work, until its pressure is 19.86. (Steam expanding under such circumstances becomes superheated, but in practice it is generally considered that the gain, if any, is usually too slight to be considered.)

1. *Case in which the steam is cut off.*

Total initial pressure,

81.5 + 14.685 = 96.185 pounds per square inch.

Total mean pressure,

23.01 + 14.685 = 37.695.

Ratio of initial to mean pressure,

37.695 ÷ 96.185 = .392.

A table given in Professor Rankine's "Treatise on the Steam Engine" shows that the point of cut off required to produce this mean pressure is .143 of the stroke from the commencement. Knowing the volume of the cylinder swept through by the piston per stroke, and the clearance, it is found that the amount of steam required per stroke is

.746 × .143 + .0157 = 0157 cubic feet.

If the temperature of the water in the reservoir before charging is assumed to be 60°, the units of heat in a pound of steam at the pressure of 81.5 per square inch are

1,213.1 − 60 = 1,153.1,

and the number of units of heat expended per stroke in one cylinder will be

1,153.1 × .2214 × .0157 = 4.

2. *Case in which the steam is wire-drawn.*

The volume of steam required for each stroke is .0831 cubic feet, and the units of heat in a pound of steam at the pressure of 19.86 per square inch are:

1,192.8 − 60 = 1,132.8,

so that the number of units of heat expended per stroke, in one engine, in this case will be

1,132.8 × .0846 × .0831 = 7.96.

A comparison of the amount of heat used in the two cases shows that the per cent. of loss by wire-drawing the steam is

$$\frac{(7.96 - 4.) \times 100}{4.} = 99,$$

or that, if the steam had been cut off and had been allowed to expand, doing useful work, it would have produced the same efficiency with an expenditure of

(4 × 100) ÷ 7.96 = 50.25

per cent. of the steam actually required. It would appear, then, that if the steam had been cut off and not wire-drawn, other things remaining the same, the amount of water required for indicated horse-power per hour would have been

68.9 × (50.25 ÷ 100) = 34.62

pounds, or that the engines would have been nearly twice as efficient.

This faulty construction of the engines does not necessarily show any defect in the principle on which the fireless locomotive is constructed. It may be interesting to the reader to consider a case in which the locomotive is properly designed, under conditions which, it is believed, can be realized in practice. In the first place, the reservoir should be so constructed that there shall be an active circulation of the water, when steam is admitted for the purpose of charging it. It is evidently desirable to carry as much water as possible, and probably the reservoir could be filled to the steam dome. A much higher steam pressure is also both desirable and practicable. The following conditions, then, will be assumed for the proposed locomotive:

That the reservoir, of the same size as that which has been already described, shall be filled to the steam dome, on starting, with water saturated with an equal volume of steam having a pressure of 275 pounds per square inch, and that at the completion of the run, the water shall be saturated with an equal volume of steam having a pressure of 20 pounds per square inch.

That the engines shall be so proportioned as to develop 4 useful horse power with an indicated power of 5⅛ (making an allowance of 25 per cent. for friction), using 25 pounds of water per indicated horse power per hour.

That there shall be a loss from radiation of 5 per cent. of the water evaporated.

DATA.

Mean pressure per square inch,

(275 + 20) ÷ 2 = 147.5.

Steam of 275 pounds pressure.

Temperature, Fahrenheit	414°.1
Temperature on the absolute scale	875°.3
Total units of heat in a pound of steam	1,240.3
Weight of a cubic foot of steam	.626

Steam of 147.5 pounds pressure.

Temperature, Fahrenheit	364°.4
Units of latent heat in a pound of steam	860.7

Steam of 20 pounds pressure.

Temperature, Fahrenheit	258°.7
Total units of heat in a pound of steam	1,192.8
Weight of a cubic foot of steam	.0849

Weight of a cubic foot of water at a temperature of 414°.1 Fahrenheit,

$$62.425 \div \tfrac{1}{4}\left(\frac{875.3}{500} + \frac{500}{875.3}\right) = 54.77 \text{ pounds.}$$

Units of heat in reservoir, on starting,

53.77 × 64.64 × 414.1 + 66.19 × .626 × 1,249.3 = 1,490,751.66.

Let X = pounds of water evaporated:

Units of heat in reservoir, at termination,

(53.77 × 64.64 − X) × 258.7 + 66.19 × .0849 × 1,192.8 = 905,913.34 − 258.7 X.

Units of heat available for making steam,

1,490,751.66 − (905,913.34 − 258.7 X) = 584,840.84 + 258.7 X.

Units of heat imparted to each pound of steam,

860.7 + 264.4 − 258.7 = 966.4

$$\frac{584,840.84 + 258.7\,X}{966.4} = X,$$

X = 826.4.

Loss from radiation,

826.4 × .05 = 41.12.

Steam available for useful work,

826.4 − 41.12 = 785.28 pounds.

Pounds of steam required by engine per hour,

25 × 5⅛ = 133⅓.

Number of hours that locomotive would run before the reservoir required recharging,

785.28 ÷ 133.33 = 5.9.

It is believed that the foregoing is a fair statement of what may be expected from this locomotive, under favorable conditions. A new locomotive is now in course of construction, which, it is hoped, will show more successfully than its predecessors in this vicinity have done the merits of the system.

The writer desires to acknowledge the courtesy of the officers of the "Fireless Locomotive Company," and particularly of the engineer, Mr. Gibson, in affording him all possible facilities for making an examination and test of the locomotive.

RICHARD H. BUEL.

No. 80 Broadway, New York, January, 1874.

Flagging Trains and Estimating Distances.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your report of the rear collision which occurred near Muir, Michigan, on the Detroit & Milwaukee Railroad, on the 29th of August last, it was stated that the rules required the brakesman of the standing train to protect his train from danger of being run into by a following train by going back six hundred (600) yards, while the brakesman went back only some 200 yards, and upon being asked why he did not comply with the rule, said in reply, that he "thought he had gone 600 yards."

The writer, when Superintendent, some years ago, found, in the first place, that under certain circumstances, such as down grade, wet or frosty rails, &c., 600 yards was not absolutely safe, and increased the distance to 1,000 yards; and in the second place, that the judgment of the average brakesmen on freight trains, in regard to distance, was of no value, particularly when affected by the universal desire to keep as near the train as possible; the writer noticed that a ready means of arriving with approximate accuracy at the distance, and one always present, existed in the telegraph poles, which are nearly or quite equidistant, being on the railway of which I was Superintendent, 200 feet apart, so that the distance of fifteen (15) telegraph poles was almost exactly 1,000 yards. The following was therefore added to the rule:

"NOTE.—*The telegraph poles being 200 feet apart, the distance of fifteen* (15) *telegraph poles will be* 1,000 *yards.*"

This was so practical and easy of application that the common form of quoting the rule soon came to be, "Go back 15 telegraph poles," and collisions from want of proper rear protection to standing trains ceased.

The way to prevent so-called "accidents" is to make their occurrence as independent as possible of high qualifications on the part of trainmen, by making the rules so plain and easy of application that the most ignorant cannot fail to know how to apply them.

W. P. S.

Safety Chains.

[The following very extraordinary case is commended to the attention of those who "do not believe safety chains are any use." We repeat what we have said before, that to run cars without these appliances is to invite danger and accident. We know just how the next one will read—it will be in large type:

"Another Slaughter!

"Terrible Accident on the —— Railroad!

"A Number of Passengers Killed and Terribly Wounded!

"One of the front cars jumped the track, and before the train could be stopped, although the engineer applied the brakes, the rear cars ran down an embankment — feet high, into the river, or on the rocks, or through the bridge. On examination by our reporter he found that the car which first left the track had no safety chains on the trucks, and in those which had them they were attached by an eye screwed into the cars timbers, which either pulled out or split the timber. In conversation with the Master Car Builder of the road, he said he did not believe 'safety chains were any use,' and the President refused to allow him to put them on the cars because the expense was $10 per car. The railroad company is doing all in its power to alleviate the sufferings of the wounded and to console the friends of the killed," etc., etc.

Now to those who think they cannot afford to put safety chains on car trucks we will only say that "alleviation" to the wounded and "consolation" to the friends of the dead are much more expensive than safety chains, and not nearly so satisfactory, even when the bills are paid]:

TO THE EDITOR OF THE RAILROAD GAZETTE:

Speaking about safety chains to trucks, the night of the 17th inst., a west-bound freight train on the Eastern Division of the Canada Southern Railway (composed of some thirty-five empty box cars) had a new car (built at the shops here) jump the track near Hagersville, the conductor and brakemen being in the caboose. The car was hauled to Townsend siding, some four or five miles, where in crossing the frog it came on again, and ran through to this place, 54 miles. No one on the train knew that the car had been off the track until its arrival here. Upon examination it was found that every oil-box and brass in the truck that had been off was broken up and entirely gone. The journals were running between the bolts that hold the oil-boxes, and had worn entirely through the truck frames in two places. The frames are wrought iron, 1x8 inches. The car while off the track had crossed six cattle-guards where the rail lies on stringers 12x14, and two trestle bridges some fifty feet each in length.

The truck chains, without any question, prevented a very serious accident.

The chains, which are put on all cars belonging to this road, are made of the best charcoal iron, ¾ inch in diameter, of five links 5⅞ inches in length, hooked above on a 1¼ in. hook which turns completely over the outer sill, where the iron is ¾x8 inches. The lower end of the chain fastens in an eye-bolt one inch in diameter with eye forged close down to truck frame. The sill hooks are set just 12 inches further apart than the center of the axles. Mr. Benton, the Master

Mechanic, has been experimenting on this matter of safety chains, and thinks he has got the thing about right; and this very remarkable test has shown very satisfactorily that the plan of using safety chains is a wise one, and further that he has got them strong enough, at least for a case of this kind. I should have said that the king-bolt was broken off entirely, and that the truck was actually brought in by these chains.

ST. THOMAS, December 19, 1873. T. H. M.

A Remarkable Experiment in Punching Cold Iron.

TO THE EDITOR OF THE RAILROAD GAZETTE:

At the meeting of the Franklin Institute held in December, 1873, two cold-punched, hexagon nuts were exhibited by Messrs. Hoopes & Townsend, bolt, nut and washer makers, of this city. These specimens are worthy of attention from the fact that one of them had a hole one-quarter of an inch in diameter and one inch deep; the other was perforated with a hole half an inch in diameter and one and a half inches deep.

These specimens are remarkable when we take into consideration the oft-made statement "that the maximum thickness of iron that can be punched cold is about the diameter of the punch," as the depth of the smallest nut is four diameters of the punch and of the largest one three diameters of the punch.

In conversation with Mr. Barton Hoopes, who conducted these experiments, I learn that he has since succeeded in punching a half-inch hole through inch and three-quarters thickness of wrought iron. The punching which came out of the hole I have examined, and find it differs in no respect from ordinary punchings, but it has been compressed to seven-eighths of an inch in length; that is, the punching shows an irregular cylinder half an inch in diameter and seven-eighths of an inch long. The metal forming the punching is not condensed into a smooth cylinder, but shows the usual roughness common to all iron punchings, while the punched holes are very smooth.

The punch and die-holes were of the same size, and there has evidently been a side flow of the cold metal upon the entrance of the punch, and the operation may, in a measure, be considered a piercing one up to a certain depth and finally the punching out of the residuum after it has attained that depth.

In punching the quarter-inch hole through one-inch iron, the punching showed a very smooth surface and was only three-eighths of an inch long, seemingly very much compressed.

I have examined the punches used in this curious experiment. They differ in no respect from those ordinarily used; they are made of good steel and hardened in some peculiar manner unknown to me.

Bars of iron one inch square punched with a quarter-inch punch show a sensible widening under the action of the punch, and a bar of inch-and-three-quarters-square iron punched with a half-inch punch is swelled sidewise to inch and thirteen-sixteenths, showing conclusively that some of the iron has been forced sidewise.

The machines used in driving the punch through this great thickness are said to be of unusual strength and accuracy of construction.

COLEMAN SELLERS.

The Cost of the Block System.

ST. LOUIS, January 13, 1874.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I feel compelled to remark on a recent notice of yours concerning the cost of the "block system" on the London & Northwestern Railway.

You suppose that the outlay of $267.00 gold per mile is mainly due to apparatus; but I must question that inference, as there are stations at least one mile apart, supplied with an attendant. His pay for the year must form a very considerable portion of that $267.00, say at least half, and the other portion will hardly require renewing in less that say ten years.

If in the course of the first year on the 1,500 miles of the London & Northwestern, the "block system" has saved a tail collision like that at "Revere," it has proved a good investment; and if it saves one every year for ten years, it will be $1,830,000.00 to the advantage of that company.

The instruments of a "block system" need cost no more than the ordinary telegraph instruments, and there will be from one to four wires used, according to the peculiar system adopted.

CHAS. A. SMITH.

[Entered according to Act of Congress, in the year 1874, by the RAILROAD GAZETTE, in the office of the Librarian of Congress, at Washington.]

CATECHISM OF THE LOCOMOTIVE.

PART III.
ON WORK, ENERGY AND THE MECHANICAL EQUIVALENT OF HEAT.

QUESTION 27. *For what purpose are all steam engines used?*

Answer. They are used to produce *motion*, which is opposed by some *resistance*. Thus, if an engine is employed to raise grain from a railroad car to the top of a warehouse, it must produce motion, which is resisted by the weight of the grain; if it is used to saw wood, it must give motion to the saw, which is resisted by the fibres of the wood; a locomotive engine must produce motion of a train of cars, which is resisted by the air, the friction of the journals and the rolling of the wheels on the track; if it is employed on a grade or incline, besides the frictional resistance referred to it must overcome that due to its own weight and that of the train, which is gradually lifted as it ascends the incline. In producing motion opposed by some resistance an engine is said to be doing "*work*."

QUESTION 28. *Can this work be accurately measured?*

Answer. Yes; but in order to measure anything we must first establish some accurate standard or unit of measurement. Thus we say a bar of iron is so many inches long, or a road is so many miles long. In like manner we speak of so many seconds, or minutes, or hours, or days, or years, when we speak of time. So it is necessary, in order to estimate or measure "*work*" in a strictly scientific manner, for us to fix upon some accurate standard or unit. In this country and in Great Britain the unit agreed upon for this purpose is the amount of power required to raise ONE POUND ONE FOOT, and is called a *foot-pound*. If we raise one pound two feet, we do two foot-pounds of work; if three feet, three foot-pounds, and so on. Again, if we raise a weight of two pounds one foot high, we likewise do two foot-pounds of work; or if we raise it two feet high, we do four foot-pounds, and so on. In order to determine the amount of work done, we must MULTIPLY THE MOTION PRODUCED *(in feet)* BY THE RESISTANCE *(in pounds)*, AND THE RESULT WILL BE THE WORK DONE IN FOOT-POUNDS.

QUESTION 29. *How many foot-pounds of work are performed in a pile-driving machine in raising a weight of* 1,200 *lbs.* 24 *feet?*

Answer. 1,200×24=28,800 foot pounds.

QUESTION 30. *When this weight is raised, is the force which was exerted in raising it annihilated or lost?*

Answer. No; because the weight has the capacity of doing an equal amount of work when it falls, from the momentum* it acquires in falling. This *power of doing work* which it acquires in falling is called *energy*. Now, although the weight has no motion-producing power when it is raised to the top of the machine, yet obviously "such action is then *possible* which when it rested on the earth was not possible. It has no energy as it hangs there dead and motionless; but energy is possible to it, and we might fairly use the term *possible energy* to express this power of motion which the weight possesses†, and which is therefore called *potential energy*. As soon as the weight is allowed to fall it acquires a greater velocity the farther it falls, and its potential energy thus becomes and is called *actual energy*.

QUESTION 31. *How do we explain such phenomena as the heating of a car-axle while turning under a car, the heating of brake blocks when the brakes are applied to car wheels, the heating of an iron rod by hammering, and of a turning tool when cutting a piece of metal?*

Answer. All of these phenomena are due to the fact that the *actual energy* of motion is converted into heat, as has been repeatedly proved by many able and ingenious investigators and experiments.

QUESTION 32. *When the weight of the pile-driver falls, is its energy also converted into heat?*

Answer. A part is expended in compressing the material into which the pile is driven and in overcoming the friction of the earth against the pile, each of which efforts develops heat, and another portion is converted into heat by the impact or blow of the falling weight on the head of the pile.

QUESTION. 33. *Is all energy convertible into heat and heat into energy?*

Answer. Yes. Science has demonstrated very clearly that they are mutually convertible.

QUESTION 34. *Has it been ascertained how much heat is equivalent to one foot-pound of work?*

Answer. Yes; it has been found from the most carefully made experiments that the amount of heat which is required to raise the temperature of one pound of liquid water by one degree of Fahrenheit‡ is equivalent to 772 foot-pounds of work. It must be remembered that this is the theoretical equivalent of heat, and that only a very small proportion of this amount of work is ever realized from the heat developed by the combustion of fuel.

QUESTION 35. *If then heat is convertible into work and work into heat, can the transmutation of the heat of the steam in the cylinder of an engine into work and the reverse process be explained?*

Answer. Yes. Take a cylinder, fig. 9, and, in order to make the conditions of the experiment as simple as possible, imagine it to be placed in a vacuum. Now let saturated steam be admitted under the piston so as to fill the cylinder half full at an absolute pressure of 100 lbs. If we will allow this steam to expand to double its volume and raise the piston *without doing any work*, and then repeat the experiment with a load of 50 pounds on the piston, whose area is one square inch, it will be found that the temperature of the steam is sensibly less, after lifting the weight, than in the previous experiment, in which it expanded without doing work, showing that part of the heat was abstracted from the steam by doing work, or, in other words, was converted into work. If then after the steam has expanded and lifted the weight, we press the piston down so that the steam under the piston is compressed to its original volume, we shall find that its temperature is the same as before, as the work done in compressing it is converted into heat. In these experiments it is assumed that there is no friction of the piston, nor loss of heat from radiation or conduction. The same phenomena can be observed in machines used for compressing air which is heated to so high a temperature when it is compressed that it is necessary to cool the cylinders of such machines by circulating a current of cold water around it.

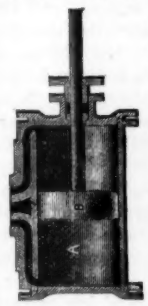

Fig. 9.

QUESTION 36. *What practical relation is there between the convertibility of heat into work, and the conducting and radiating properties of different substances explained in answer to Question 26?*

Answer. The fact that heat is only another form of energy, or "the power of doing work," indicates that its loss by conduction or radiation lessens that power just as much as or more than the loss or waste of coal would, and therefore every effort should be made to protect the different parts of engines from loss of heat by covering them with substances which conduct or radiate very little heat. Care should also be taken to exclude cold air from circulating in contact with these parts, and excepting for supporting combustion, the nature of which will be explained hereafter, it should be excluded from the heating surface of boilers.

QUESTION 37. *What is meant by the term* LATENT HEAT OF EVAPORATION?

Answer. By *latent heat* is meant that heat which *apparently* disappears when water or other liquids are vaporized. Thus, it is found that if any quantity of water is converted into steam at any pressure, it is necessary not only to heat it to a temperature equivalent to that of the steam, or to the boiling point, but after it has reached that temperature an additional amount of heat must be added in order to keep up the process of boiling. Notwithstanding this addition of heat to the water, the temperature of the steam produced will not be higher than that of the boiling water, thus showing that a considerable quantity of heat is absorbed the only effect of which is to change the water into a gas or steam. This apparent disappearance of heat can be shown if we take a pound of boiling water whose temperature is 212 degrees and mix it with a pound of ice-cold water at 32 degrees. The result will be a mixture of two pounds of water of a mean temperature of 122 degrees. If now we convert a pound of water into steam at atmospheric pressure, the steam will heat 6.37 lbs. of ice-cold water up to 122 degrees, showing that a pound of steam at atmospheric pressure contains over six times as much heat as a pound of water of the same temperature as indicated by a thermometer. A similar apparent disappearance of heat occurs when other liquids are evaporated, and when ice or any other solid is converted into a liquid.

QUESTION 38. *What is the explanation of these phenomena?*

Answer. The exact reasons which will explain them fully are probably not yet clearly understood, but it is at least extremely probable that when any substance is changed from a solid to a liquid, or from a liquid to a gaseous condition, "a large portion of the heat is spent *in doing work* against the force of cohesion."‖ The particles of solid bodies, as we know, are so united that it requires more or less force, according to the nature of the substance, to tear them apart. Now we can conceive that the heat is changed into a form of energy, and in that condition resists this attraction of the particles to each other, and that being thus transformed it has lost the capacity of expanding the mercury in the thermometer. A similar effect takes place when a liquid is converted into a gas. In the former condition the particles move freely about each other and have little or no attraction for each other, but when it becomes a gas they have a *repulsion from* each other. The heat is thus converted into the energy of repulsion, and therefore is in reality no longer in the condition of heat and consequently does not affect the thermometer. We can illustrate this by supposing that by using steam, heat is converted into work by raising the weight, or drop as it is called, of a pile-driving machine. When the weight is raised to the top of the guides from which it falls, although, as already explained, the heat is converted into *potential energy*, yet if we attached a thermometer to the drop we would not find that it was any warmer than before the drop was raised. If it were possible to make an instrument sufficiently sensitive to indicate an instantaneous change of temperature in the weight while falling, we would not find any increase of its temperature at the instant it had acquired its greatest momentum and just before it struck the object under it, although its potential energy would at that instant be converted into *actual energy* of motion. If, however, the weight should strike an unyielding object, its actual energy would at once be reconverted into heat, which our thermometer would indicate. The phenomenon of what is called latent heat of evaporation seems to be very similar to that described—the heat when the water is changed from a liquid to a gaseous condition is transformed into energy, which, as already stated, has no effect upon the mercury of the thermometer.

QUESTION 39. *What is meant by the* TOTAL HEAT *of steam?*

Answer. The total heat of steam is a phrase used to denote the sum of the heat which disappears in evaporating one pound of water under a given pressure (or *latent heat of evaporation*), and of the heat required to raise its temperature from some given point up to the boiling point due to the given pressure. Thus the latent heat of one pound of steam at atmospheric pressure is 966.6 units; and 212 units of heat are necessary to raise water from zero to the boiling point; therefore the total heat of steam of atmospheric pressure is 1178.6 units. At 100 pounds pressure the latent heat is 879.1 and the sensible heat 337.8 degrees; therefore the total heat measured from zero is 1,216.9 units.

*Momentum is not a very exact term, but is used here because it ordinarily conveys the idea we wish to express.

†Tyndall's "Heat Considered as a Mode of Motion."

‡ This amount of heat is called the British unit of heat, and is the one adopted in this country.

‖ Balfour Stewart on the Conservation of Energy.

PERSONAL.

—Col. Peter T. Abell, President of the Atchison & Nebraska Railroad Company, died at his residence in Atchison, Kan., January 17, in the sixty-first year of his age.

—Mr. C. Hamilton, Superintendent of the Cairo & St. Louis Railroad, was presented with a valuable gold watch at East St. Louis, December 31, by the employees of the road.

—Mr. Isaac Cate, President of the Central Railroad Company of Iowa, was seriously, and Mr. D. H. Pickering, General Superintendent of the same road, was slightly injured by an accident on the St. Louis, Kansas City and Northern road at Dardennes, Mo., January 17.

—Mr. W. H. Pettibone, Assistant General Superintendent of the Burlington, Cedar Rapids & Minnesota Railway, was presented with a handsome silver set at Cedar Rapids, Ia., January 8, by a number of patrons of the road.

RAILROAD GAZETTE

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Editorial Announcements.

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

THE GREENWICH STREET ELEVATED RAILROAD.

If all that has been written on the subject of rapid transit" in New York were collected and published, it would fill many large volumes. Most of it, however, would be very dull and unprofitable reading, we fear. Plans innumerable have been proposed, and have had earnest advocates, most of whom have been conspicuously ignorant of the question about which they have held such very decided opinions. The number of people in New York who think they know how to build a rapid transit railroad is, we believe, quite as large as of those who are sure they could edit a newspaper or "keep a hotel." It is amusing to hear how some of these will assert in the most dogmatic way principles about which the most experienced engineer would hesitate to give an opinion. The whole subject has been up for discussion for twenty years or more, and makes its appearance annually in the State Legislature. No systematic effort, so far as we know, has thus far been made to collect accurate information, and the public mind is consequently in a state of chaos regarding the whole subject. The only plan which has thus far been put into practical operation is what is known as the Greenwich Street Elevated Railroad, but whose actual corporate name is the "New York Elevated Railroad," of which we give a perspective view and also a lithograph, showing its construction, in this number of the RAILROAD GAZETTE. The plan for this road was originated by Mr. C. T. Harvey, and a company was organized and application was made to the Legislature for a charter empowering it to construct an experimental line. This was passed April 22, 1867. Section 2 of this act was substantially as follows:

"The railway hereby authorized shall be operated exclusively by means of propelling cables attached to stationary engines, placed beneath or beyond the surface of any street through which such railway may pass, and shall be concealed from view so far as the same may be detrimental to the ordinary uses of said streets. The structure shall consist of a single track, upon which the cars are to be moved in contrary directions upon opposite sides of the street, which track shall not exceed five feet in width between centre of rails, and shall be supported by a series of iron columns not exceeding eighteen inches in diameter at surface of pavement, or equivalent space (if in an elliptical form,) which columns shall be placed at intervals of not less than twenty feet (except at street crossings or sidings), along the curbstone line between the sidewalk and carriage way, and attached at their upper extremities to the track aforesaid, so that the centre of the track shall be perpendicular to the centre of the columns, and at a distance of not less than fourteen feet above the surface of the pavement. Whenever deemed necessary to prevent oscillation of the track aforesaid, a second series of columns may be extended on the building side of the sidewalk, at intervals of not less than twenty feet, which shall not be more than nine inches in diameter at surface of pavement, and shall be so placed as not to obstruct any existing door or window without consent of the owner, and from the upper extremity of which braces or girders may be extended to the first series of columns mentioned for purposes aforesaid."

After the passage of this act the company proceeded to erect on the east side of Greenwich street an experimental section extending from the Battery to Dey street, a distance of about half a mile. This was completed in the month of July, 1868. After the construction of this portion, which was built with Phœnix wrought-iron columns, the company felt sufficient confidence in the plan to extend the road through Greenwich street and Ninth avenue to Thirtieth street. This was completed in the spring of 1870. The originator of the plan proposed to use endless chains, or rather wire rope cables, worked by stationary engines for moving the trains. As soon as the road was completed to Thirtieth street, experiments were made to test the practicability of the road, and of the method proposed to propel the cars. After expending large amounts of money in these experiments, it was soon shown that the plan was totally impracticable and a failure in every respect. Meanwhile those who had contributed large sums towards its construction lost confidence in the project, and the road was finally placed in the hands of trustees and ultimately sold under foreclosure of mortgages held by various parties. A new company was then organized called the New York Elevated Railroad Company, with a capital of $10,000,000, of which $800,000 is said to have been paid up. Meanwhile the wire-rope system had been abandoned and removed, and a light four-wheeled engine had been constructed and placed on the road. This proved so successful that the company commenced transporting passengers April 20, 1871. The road rapidly gained in favor, so that more engines and cars were needed. New cars were therefore built, an engraving of which was published in the RAILROAD GAZETTE of August 17, 1872, and the construction of which is shown in the perspective view of the road in this number.

After the failure of the wire-rope system, the road became a standing object of ridicule. It was obvious that there were grave defects, not only in the method of propelling the cars, but in the construction of what might be called the sub-structure. The supporting columns consisted of 15-inch Phœnix columns, which were made with two curved branches at the top, similar to the limbs of a tree. These, it soon appeared, were very weak, and were at once strengthened with braces. Last year the company determined to improve on the first plan employed, and erected another section at the upper end of the line, extending from Thirtieth to Thirty-fourth street. This was designed by and erected under the supervision of the Superintendent of the line, Mr. D. W. Wyman, who had also designed the engine and cars, and who brought order out of chaos, and from a road which was universally pronounced a complete failure has developed a line which is steadily growing in public favor, and has clearly demonstrated the practicability of roads built on this system. This has been done very quietly, and although trains have been running regularly for nearly three years, a large proportion of the people in New York are still ignorant of that fact.

The new portion of the line which we have illustrated consists of columns formed out of four round, solid wrought-iron bars 4½ inches in diameter, bent into the shape represented. These are attached to a heavy cast-iron foundation plate bolted down to a foundation of masonry, as shown in the lithograph on colored paper. At the top, the wrought-iron bars are bent outward into four branches, two of which are for lateral support, and two for longitudinal stiffness. The four bars are tied together with wrought-iron bands at the neck of the columns, or just below the point from which the bars begin to branch outward, and also at the top. These columns are placed from 30 to 60 feet apart, and the roadway between is supported on two wrought-iron girders, each formed of two 12-inch channel bars. These are trussed at the street crossings, as shown in the lithograph, but not in the shorter spans. The perspective view is from a photograph taken above Thirty-fourth street, looking southward. The stations are usually placed over the street crossings with the stairs leading down the cross street.

The equipment of the road now consists of four engines and ten cars. Two more engines are ordered and will soon be on the road. They weigh 8,000 lbs. each; the cylinders are 7 by 10 inches, and the four driving wheels 30 inches in diameter. We expect soon to give an engraving of one of these engines with fuller details. The cars seat 48 passengers and weigh 11,000 lbs. As two cars are usually run to each train, it will be seen that the actual weight of train, including engine, is only 312 lbs. per passenger.

The length of the line is now within a small fraction of four miles. The road is laid chiefly with iron rails of 36 lbs. weight per yard, but some new steel rails have been put down. The height in the clear above the street crossings is in no case less than 14 feet, but in order to equalize the grades is often more. The heaviest grade is 127 3-10 feet per mile, and the shortest curve of 56 feet radius. The draw-bars of the cars are attached to the trucks so that the draft is nearer the center line of the track than it would be if the draw-bar was attached to the car body. The cars all have Moore's patent elastic wheels with steel tires, and are 28 inches diameter, with steel axles. The consumption of coal was accurately kept last Summer while running 82 miles, and was 500 lbs. of anthracite, which is the fuel used, so that the consumption per mile run was only 6.1 lbs. The method of taking coal is to fill an ordinary coal scuttle and carry it up to the engine. This supplies more than enough for the round trip, or a run of eight miles. One gallon of oil runs an engine a week, or 492 miles. The economy of operating the road is therefore obvious. In fact, a visit to their diminutive shop opposite Bowling Green is quite amusing, as everything there is on such a small scale as to seem like playing at railroading.

As stated before, the road now extends from Bowling Green to Thirty-fourth street, or very nearly four miles. Between the termini of the road there are seven stations, as follows: at Dey, Franklin, Canal, Houston, Twelfth, Twenty-first and Thirtieth streets. There is one turn-out or switch at Twelfth street. The company now runs 82 trains over the road each day, the first one leaving Bowling Green at 6:20 A. M., and the last, Thirty-fourth street at 7:55 P. M. The shortest running time is 18 minutes from one terminus to the other. The fare is ten cents for all distances. From April 20, 1871, to January 2, 1872, 54,968 paying passengers were carried; in 1872, 242,190; in 1873, 723,253; and for the first half of January of this year, 35,269 passengers have been carried, or at the rate of over 800,000 passengers per year. With additional equipment doubtless the number carried will be increased still more.

The company now contemplates extending the line to the South and Staten Island ferries, and will reach them by going down along the Battery and up Whitehall street and across Bowling Green. The intention is to extend the line northward to the Harlem River, but some additional legislation is wanted before doing so.

There is this noteworthy fact in connection with this road, that it has now been running since April 20, 1872, and in that time has carried considerably more than a million of paying passengers, to say nothing of dead-heads, and thus far it has not injured any of them in any way. Of course, this security against accident has been the result of the utmost vigilance. The old portion of the road is, as any one having the slightest claim to engineering knowledge can see, very badly designed. The structure has not the stability which one intended to be as permanent as this should have. It is, in fact, of this part of the line that the story is told that some one asked one of the first managers who their engineer was. He replied "Damn engineers: we have employed a *practical man*." The structure in Greenwich street is, we presume, the monument of the said "practical man." Allowing, however, for all its defects, this company has by actual experience demonstrated the practicability of this kind of road. Any one who will take a ride on it will learn that it is the pleasantest way of travelling he will find in New York. It is high enough above the streets to give a good view, and be out of the dust and dirt. The line has no obstructions of trucks and wagons, which are so annoying down town to the street roads. The Elevated Railroad Company also refuses to take more passengers than it can seat. Its cars are kept clean and comfortable, although, as in nearly all attempts at ventilation, they have ample provision for exhausting the foul air but none for admitting that which is pure. This, we presume, will be remedied in time. The fact remains, however, that it is now the quickest, pleasantest, and, as their record shows, the safest method of travelling in New York. The great bug-bear that is always raised to oppose any new improvement, viz., injury to private property, has nearly disappeared, and very little or no complaint is heard from the people along the line of the road. The great obstacle in the way of nearly all the projects proposed for rapid transit has been their enormous expense. The cost of a road like that we have illustrated is about $150,000 per mile of single track, whereas the Gilbert Elevated road is estimated to cost $700,000 per mile for a double track, and any underground line will be much more. As the practicability of operating such roads has thus been demonstrated, and as their cost is so much less than that of any other plan, their future success seems assured.

The practical difficulty with the present structure is its want of lateral stiffness. This is provided for in some other plans which the company has under consideration. In some of these the privilege has been availed of which their charter gives them, of placing columns next to the buildings along the line of their road. It is then contemplated to carry girders from the outer to the inner columns to give lateral stiffness, and also to carry a sidewalk to be constructed between the railroad and the front of the buildings. This would at once give two fronts, an upper and lower one, to each building; it would give an additional sidewalk above the present one, which in pleasant weather would be the most agreeable place to walk, as it would be elevated and be almost entirely free from dust and mud, and be without interruption or obstructions from vehicles, as the present sidewalks are wherever they cross a street. The upper sidewalk would

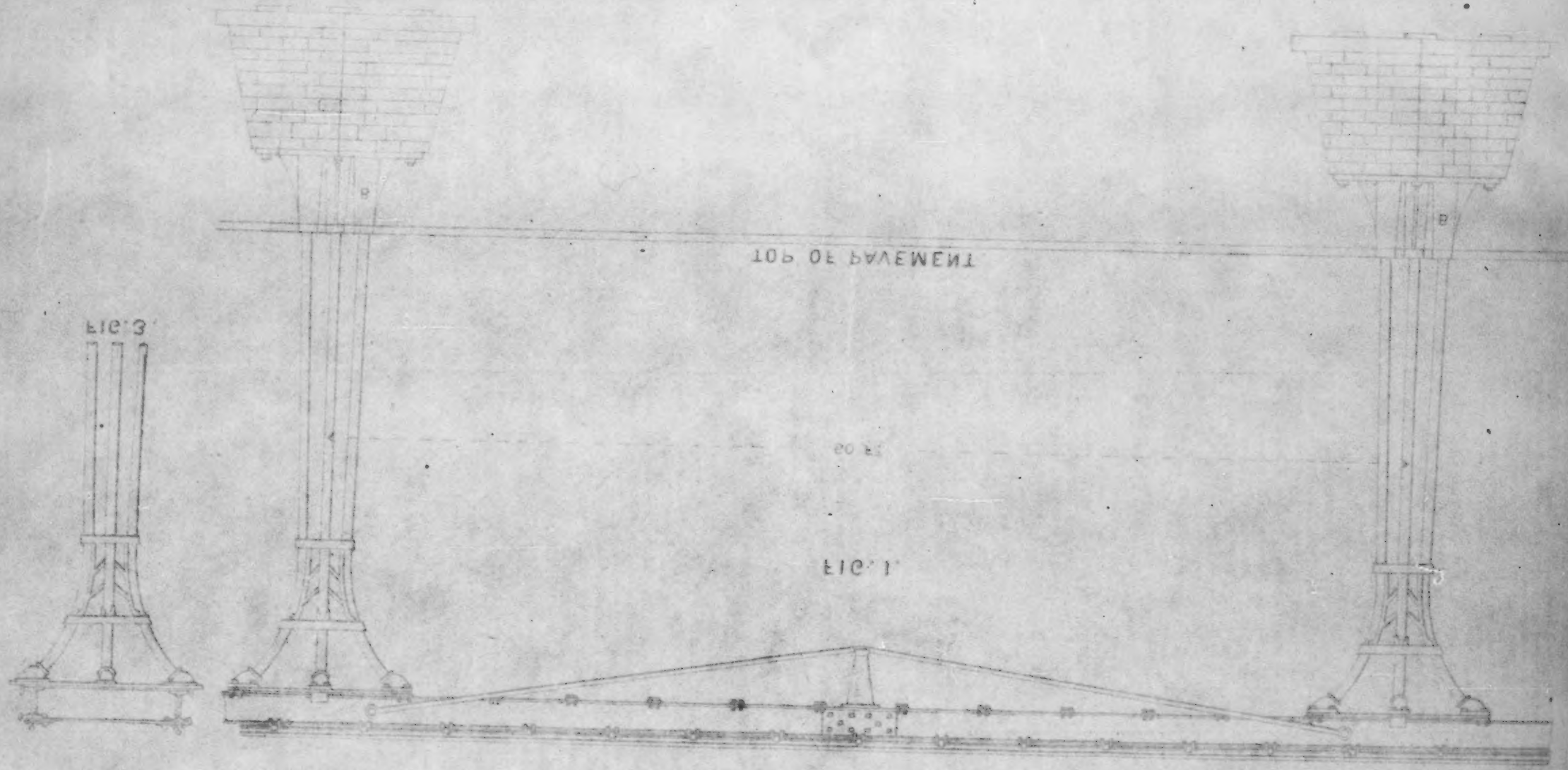

FIG. 1.

FIG. 4.

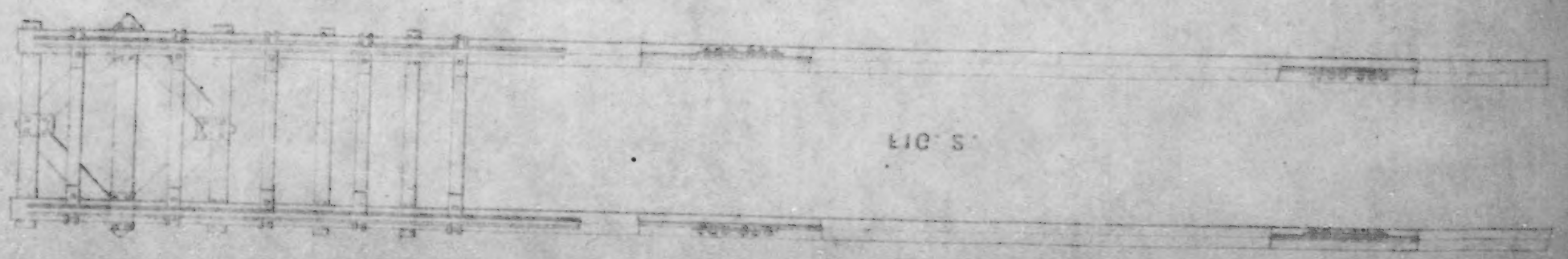

FIG. 5.

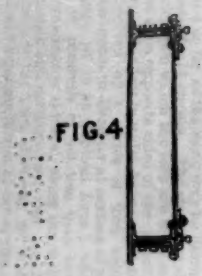

FIG.4

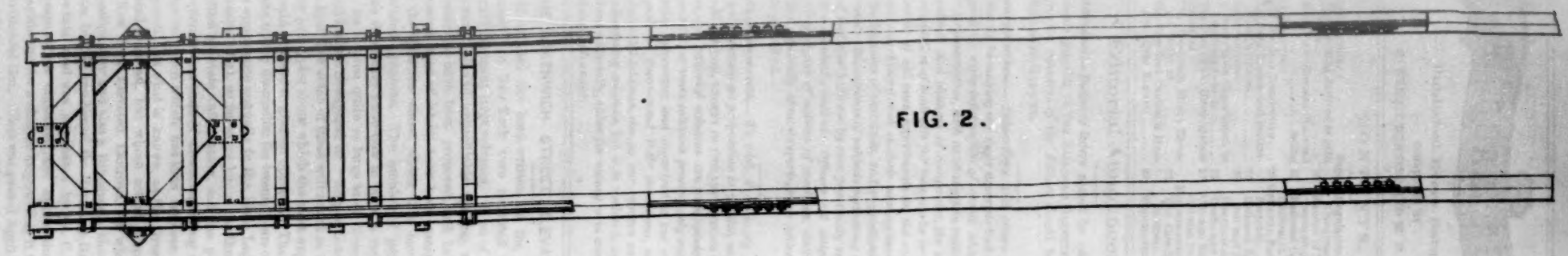

FIG. 2.

NEW YORK ELEVATED RAILROAD.

SCALE ¼ INCH = 1 FT.

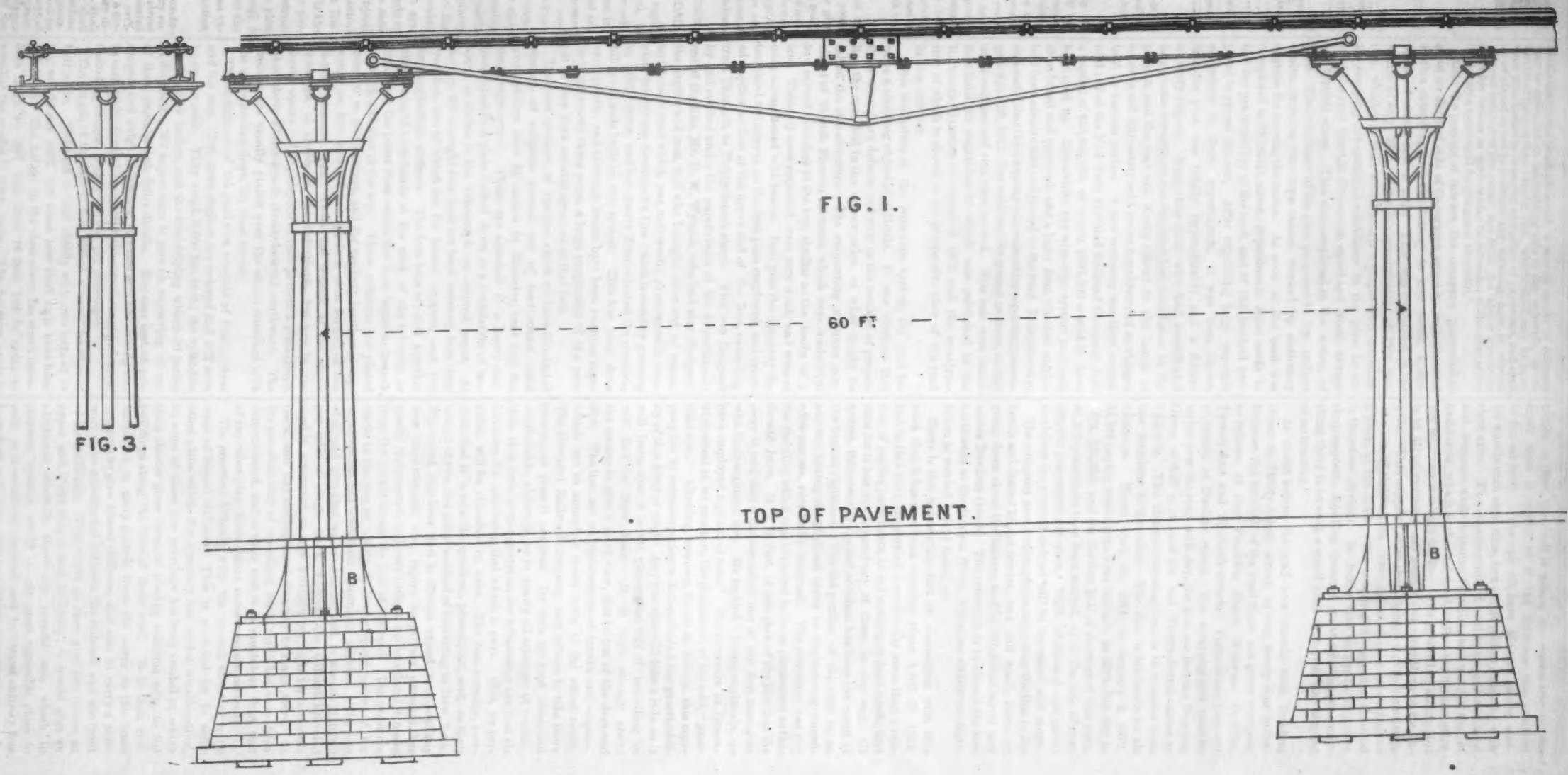

FIG. 1.

FIG. 3.

also cover the lower one, so as to protect it from rain, snow and sunshine, so that in reality the upper one would be pleasanter in good weather than the present one now is, and the present one would be pleasanter in bad weather with the elevated one over it. Of course the objection is at once made that by erecting such a structure you obstruct the light and air from private property. This evil, if it is one, could be obviated to a great extent by leaving an open space four or five feet wide, if property holders desired it, between their buildings and the upper sidewalk. In fact, however, we find that on many business streets property holders, instead of regarding such a covering or awning as an evil, think it is very desirable, and they go to considerable expense to erect permanent coverings over their own sidewalks. In Reading, Pa., the sidewalks of whole blocks of buildings are thus covered with structures of uniform and very neat design. The effect is very pleasing, and, instead of being an injury to property, is a decided advantage. If, in addition to the covering to the lower sidewalk, an upper one is provided, as we have said, it would give another front to the buildings which would be excellently adapted for certain kinds of business, the effect of which, we venture to say, would soon be to increase the value and the rent of such property.

A road thus constructed could have all the lateral stability required, and the roadway above could be deadened in some way so as to make the noise of the trains above a less annoyance than wagons rolling over cobble-stones now are. Such roads, instead of diminishing the capacity of the street, would increase it, not only by the addition of a railroad, but also by adding another sidewalk; whereas many of the plans proposed obstruct the middle of the street very much to the detriment of the free movement of vehicles; and if any one wishes to get an idea of the degree to which a street will be darkened by constructing a roadway over the middle of it, let him go under a bridge where it crosses any ordinary road or street.

It is not necessary to say anything here of the importance, in many different ways, of rapid transit to New York. Pecuniarily it would widen her borders immensely, and the population which belongs to her, instead of being driven east and west across her two rivers, would find convenient and in every way desirable homes to the northward, in Westchester County. It is the one possible remedy for the overcrowding which has imposed so many social, moral and political evils upon the city, and seems likely to grow worse in degree and consequences, unless some means shall be provided for supplying frequent rapid and cheap means of travelling between those parts of the city where its business is done and the districts in and near it now thinly peopled.

If the New York Elevated Railroad Company can, as we hope it will, get such legislation as it needs, we trust that it will offer a premium for the best design for the construction of its line. We are by no means sure that its last construction is the best possible, although it is better than the first. But by offering a premium for the best plan and referring the decision to some competent persons, it would call out some of the ablest talent in the country, and even if this present construction should be better than any other design presented, no harm would be done by getting other people's ideas. On the other hand, it is possible that some of our skillful engineers could devise a structure less expensive, stronger or safer than that now adopted.

The New York Central & Hudson River Report.

The only report published by this company is that made to the State Engineer and Surveyor, to satisfy the requirements of the law. The requirements do not form a very complete report, but it is the only one we get.

The property owned and worked by this company was as follows for the two years ending with September:

	1871-'72.	1872-'73.
Miles of road owned	740.17	740.17
Miles of road leased	110.50	118.17
Total mileage worked	850.67	858.34
Miles of second track and sidings	757.29	838.48
Locomotives	447	511
Dummy engines	8	8
First-class coaches	321	351
Second-class coaches	70	70
Baggage, mail and express cars	158	177
Freight cars	10,583	13,745

This is an increase of nearly 1 per cent. in the mileage of road worked, and of 10¾ per cent. in the length of second track and sidings, of 14 per cent. in locomotives, 9½ per cent. in first-class coaches, 12 per cent. in baggage, mail and express cars, and more than 25 per cent. in freight cars.

The above property was represented by the following:

CAPITAL ACCOUNT.

	1871-'72.	1872-'73.	Increase.
Stock	$84,699,300	$84,699,300	.....
Stock certificates	4,729,000	4,729,000	.....
Funded debt	16,496,020	27,725,533	$11,229,513
Floating debt	1,167	1,167	.....
Total	$105,925,487	$117,155,000	$11,229,513
Cost of road and equipment	63,:99,925	78,014,954	14,715,029

The increase in capital account is wholly in the funded debt, which is larger by 68 per cent. and makes an addition of 10½ per cent. to the whole capital account. The increase of cost of construction is larger both absolutely and relatively—being, indeed, no less than 23½ per cent. The capital account per mile of road owned is now $158,281, and the construction account per mile $105,401.

The work done by this property was as follows:

	1871-'72.	1872-'73.
No. passengers carried	7,138,779	7,630,741
Passengers carried one mile	319,150,960	339,122,621
No. tons of freight carried	4,393,965	5,522,724
Tons carried one mile	1,020,908,885	1,246,650,063

The increase in passenger mileage is 6¼ per cent., in freight tonnage mileage 22 per cent.

The revenue from this business was:

RECEIPTS.

	1871-'72.	1872-'73.	Inc. or Dec.
Passenger	$6,662,007	$6,999,456	+$337,449
Freight	16,259,646	19,616,018	+3,356,372
Other	2,659,022	2,511,377	—147,645
Total	$25,580,675	$29,126,851	+$3,546,176

This is an increase of 5 per cent. in passenger earnings, of 20¾ per cent. in freight earnings, and a decrease of 0.6 per cent. in other earnings. The increase in total earnings is 13⅞ per cent.

	1871-'72.	1872-'73.
Receipts per passenger per mile	2.08 cents.	2.06 cents.
Receipts per ton of freight per mile	1.59 "	1.57 "

This is a decrease in the average rate of 1 per cent. for passengers and 1¼ per cent. for freight.

EXPENDITURES.

	1871-72.	1872-73.	Inc. or Dec.
Maintenance of road	$5,153,498	$4,233,489	—$920,009
Maintenance of equipment	4,150,599	3,353,376	— 797,223
Working the road	7,142,339	10,055,122	+2,912,783
Totals	$16,446,436	$17,641,987	+$1,195,551

The changes here are notable and not easily intelligible, there being a decrease of 17⅞ per cent. in maintenance of road, and of 19⅛ per cent. in maintenance of equipment, concurrent with an increase of no less than 40¾ in conducting transportation. As the year included the whole of the terrible Winter, the most destructive of road and rolling stock of any in the history of railroads probably, and the mileage of trains was greater by one-sixth, it is strange that there should have been any decrease, not to say one of 18 per cent. or more, in the cost of maintenance. The cost of all maintenance per train mile by this report was 77.6 cents in 1871-72, and only 54.3 in 1872-73, the decrease per train mile being just 30 per cent. The working of the road, on the contrary, cost 71.9 cents per train mile in the latter year, against 59.6 in the former, an increase of 21 per cent. Thus the whole expense per train mile was $1.372 in 1871-72, against $1.262 in 1872-73, showing a decrease of 11 cents per train mile, or 8 per cent.

NET EARNINGS AND THEIR DISTRIBUTION.

	1871-72.	1872-73.
Net earnings	$9,134,239	$11,484,86
New construction	712,237	2,364,747
Interest	1,030,372	1,218,422
Dividends	7,244,832	7,136,790
Rents	131,996	745,384
Cash balance	14,802	21,521
	$9,134,239	$11,484,864

The increase in net earnings is 25¾ per cent., and is a little more than absorbed by expenditures for new construction not charged to capital. The increase in interest payments does not correspond with the increase in bonded debt, for the reason that the latter was incurred so late in the year that little interest had accrued on it.

Taking a single mile of road the facts of the report appear as follows:

Capital:	1871-72.	1872-73.
Stock and scrip	$120,821	$120,821
Bonds	22,287	37,458
Cost	85,521	105,401
Earnings	30,071	33,934
Working expenses	19,334	20,554
Net earnings	10,738	13,380
Interest payments	1,392	1,646
Dividends	9,788	9,642
Train mileage	14,092	16,285
Passenger mileage	375,158	395,091
Tonnage mileage	1,200,123	1,452,396

In this, stock and scrip, bonds, cost, interest payments and dividends are given per mile of road *owned*, the other items per mile worked.

Briefly, we may summarize: With a road and equipment which cost 23½ per cent. more than the previous year, and was represented by an increase of 10¾ per cent. in the capital account, the company earned gross 13¾ per cent. and net 25¾ per cent. more, the increase in net earnings being just about as large as the increase in the cost of the property. It is not probable, however, that the improvements represented by the increased cost had progressed sufficiently to affect largely (at least not to their full extent) the earning capacity of the road during the year reported. They should tell better the current year, and still more thereafter. As the money with which these improvements were made costs the company but 6 per cent., and the average earnings on the whole capital account are 9.8 per cent., the profitable nature of the improvement to the company is evident. And by means of the improvement or otherwise the *average* productiveness of the capital has been increased, it having been only 8.6 per cent. in 1871-72 against 9.8 per cent. in 1872-73.

If we reckon from the basis of the *cost* of the property, however, the net returns were 14.4 per cent. in the first-named and 14.7 per cent. in the second year.

RAILROAD EARNINGS IN DECEMBER, 1873.

Name of Road.	Mileage. 1873.	Mileage. 1872.	Increase. Miles.	Increase. Per Ct.	Earnings. 1873.	Earnings. 1872.	Inc.	Dec.	Per cent.	Earnings per mile. 1873.	Earnings per mile. 1872.
Atlantic & Great Western	571	539	32	6	$421,309	$404,900	$16,409	.....	4	$738	$751
Atlantic & Pacific	328	328	....	....	91,651	97,196	.....	$5,545	5¾	279	296
Burlington, Cedar Rapids & Minnesota	415	261	154	59	118,946	84,622	34,324	.....	40½	287	324
Baltimore & Ohio	1,008	917	91	9⅞	1,086,937	1,035,296	51,641	.....	5	1,078	1,129
Central Pacific	1,218	1,094	124	11⅓	1,072,750	1,037,992	34,758	.....	3⅜	881	949
Chicago & Northwestern	1,430	1,353	77	5¾	1,019,502	859,780	159,722	.....	18⅝	713	635
Chicago, Lanville & Vincennes	157	132	25	19	51,958	49,440	2,518	.....	5⅛	331	375
Cleveland, Col., Cin. & Indianapolis	470	470	....	....	304,612	358,743	.....	$4,131	15⅛	648	763
Erie	971	971	....	....	1,625,129	1,437,283	187,846	.....	13 1-16	1,673	1,480
Illinois Central	1,109	1,109	....	....	617,943	698,063	.....	80,120	11½	557	629
Indianapolis, Bloomington & Western	344	212	132	61¾	122,614	126,124	.....	3,510	2¾	356	595
Kansas Pacific	672	672	....	....	201,493	223,241	.....	21,748	9¾	300	332
Lake Shore & Michigan Southern	1,174	1,131	43	3¾	1,546,983	1,483,480	63,503	.....	4⅓	1,318	1,312
Michigan Central	787	715	72	10	644,022	576,783	67,239	.....	11⅝	818	807
Milwaukee & St. Paul	1,236	1,121	115	10¼	843,200	513,787	329,413	.....	64⅛	682	467
Missouri, Kansas & Texas	784	640	144	22½	276,518	200,225	76,293	.....	38⅛	353	313
Mobile & Ohio	517	517	....	....	380,338	360,056	20,282	.....	5⅝	736	696
Ohio & Mississippi	393	393	....	....	282,608	261,275	21,333	.....	8⅛	719	665
Pacific, of Missouri	471	471	....	....	306,078	257,215	48,863	.....	19	650	546
St. Louis, Alton & Terre Haute, Main Line	266	266	....	....	94,605	102,613	.....	8,008	7¾	356	386
" " " Branches	71	71	....	....	38,996	51,178	.....	12,182	23¾	549	721
St. Louis & Iron Mountain	310	285	25	9	171,600	205,698	.....	34,098	16½	354	707
St. Louis, Kansas City & Northern	583	583	....	....	224,290	241,985	.....	17,695	7⅓	385	415
St. Louis & Southeastern	349	349	....	....	96,342	72,309	24,033	.....	33⅓	276	207
Toledo, Peoria & Warsaw	237	237	....	....	85,625	90,856	.....	5,231	5¾	361	383
Toledo, Wabash & Western	628	628	....	....	444,232	462,235	.....	18,003	3⅞	707	736
Total	16,499	15,465	1,034	6¾	12,170,281	11,292,375	1,138,177	260,271	....	$738	$730
Total increase	....	....	....	....	.....	.....	877,906	.....	7¾	....	....

RAILROAD EARNINGS, YEAR 1873.

Name of Road.	Mileage. 1873.	Mileage. 1872.	Increase. Mls.	Increase. Per Ct.	Earnings. 1873.	Earnings. 1872.	Increase.	Decr'se.	Per Ct.	Earnings per Mile. 1873.	1872.	Inc.	Dec.	Per Ct.
Atlantic & Great Western	550	539	11	2	$5,184,288	$5,257,983	.....	$73,695	1⅜	$9,426	$9,755	.....	$329	3⅜
Atlantic & Pacific	328	328	....	.....	1,271,910	1,141,278	$130,632	.....	11½	3,878	3,480	$398	.....	11½
Burl., Cedar Rap. & Minn.	355	261	94	36	1,188,049	995,959	192,090	.....	19⅓	3,347	3,816	.....	469	12¼
Central Pacific	1,218	1,094	124	11⅓	13,938,969	12,734,729	1,204,240	.....	9½	11,444	11,641	.....	197	1⅝
Chicago & Northwestern	1 409	1,344	65	4⅞	13,545,167	12,272,061	1,273,106	.....	10⅜	9,613	9,124	489	.....	5⅜
Chicago, Danville & Vin	142	132	10	7½	696,726	604,829	91,897	.....	15⅕	4,906	4,582	324	.....	7½
Clev., Col., Cin. & Ind	470	430	40	9¼	4,634,533	4,462,624	171,909	.....	3⅞	9,861	10,378	.....	517	5
Denver & Rio Grande	118	100	18	18	392,504	274,422	118,082	.....	43	3,326	2,744	582	.....	21¼
Erie	971	965	6	0⅝	19,621,781	18,925,692	696,089	.....	3 11-16	20,209	19,612	596	.....	3
Illinois Central	1,109	1,109	....	.....	8,054,061	8,026,750	27,311	.....	0 5-16	7,262	7,238	24	.....	0 5-16
Indianapolis, Bloom. & W.	300	212	88	41⅓	1,591,878	1,360,002	231,876	....	17	5,306	6,415	.....	1,109	17¼
Kansas Pacific	672	672	....	.....	3,505,175	3,651,645	.....	146,470	4	5,216	5,434	.....	218	4
Lake Shore & Mich. South.	1,151	1,055	96	9⅓	19,287,058	17,591,629	1,695,429	.....	9⅝	16,757	16,674	83	.....	0½
Milwaukee & St. Paul	1,199	1,087	112	10⅓	9,046,151	6,957,771	2,088,380	.....	30	7,545	6,401	1,144	.....	17⅞
Missouri, Kansas & Texas	713	529	184	24⅞	3 413,027	-1,896,600	1,516,427	.....	89⅓	4,787	3,585	1,202	.....	33⅓
Mobile & Ohio	517	517	....	.....	2,801,077	2,952,003	.....	150,926	5⅛	5,418	5,710	.....	292	5⅛
Ohio & Mississippi	393	393	...	.....	3,606,168	3,526,695	79,473	.....	2¼	9,176	8,973	203	.....	2¼
Pacific of Missouri	471	432	39	9	3,671,866	3,532 562	139,304	.....	3 15-16	7,796	8,177	.....	781	4⅝
St.L.,Alt. & T.H.,main line	266	266	....	.....	1,353,213	1,407,066	.....	53,853	3 13-16	5,087	5,290	.....	203	3 13-1 6
" " " branches	71	71	....	.....	586,223	518,682	67,541	.....	13	8,257	7,305	952	.....	13
St. Louis & Iron Mountain	294	244	50	20½	2,260,418	2,251,242	9,176	.....	0⅖	7,688	9,226	.....	1,538	16⅔
St. L., Kan. City & North.	583	583	....	.....	2,761,959	2,856,920	.....	94,961	3⅓	4,737	4,900	.....	163	3⅓
Total	13,300	12,363	937	7 9-16	$122,412,201	$113,199,144	$9,732,962	$519,905	.....	$9,204	$9,156	$48	.....	0½
Total increase	.....	.....	.....	.....	.....	.....	9,213, 057	.....	8⅛	.....	.....	.....	.....	.....

Regulation of Charges by Congress.

The House Committee on Railroads and Canals in Congress has presented an elaborate report on the authority of Congress to regulate the railroad transportation and the expediency thereof, together with a bill for a National Railroad Commission, which will have power, we understand, to fix rates. The report is almost exclusively a legal argument, on the authority of Congress to take the action proposed in the bill. Only a very few words are said as to the justice and expediency of such a measure, they being assumed, the only shadow of an argument being the statement that "It has been claimed by well-informed experts before your Committee that grain can be carried from Chicago to New York at a fair profit for about twelve cents per bushel;" the fact being that if the freight carried on the New York Central had been carried at that rate in the year ending with September last, its receipts would have been about $3,000,000 less than its bare working expenses, and the company would have been so much worse than bankrupt. The Lake Shore & Michigan Southern at the same rate for freight would have had its receipts a little more than $4,000,000 less than its working expenses, and of course could not have been worked for want of money to pay for supplies and wages, to say nothing of failing to pay interest on its bonds.

On the Pennsylvania Railroad for the year 1872 (the last reported), such a rate for freight would have reduced the freight receipts from $16,856,891 to $5,208,779, and left the gross earnings $3,400,000 less than the working expenses.

The average rate for freight on the Lake Shore road is less, we believe, than on any other railroad in America whose traffic is not chiefly mineral, so that the percentage of reduction by adopting a rate equal to 12 cents a bushel from Chicago to New York would be larger on any other road. It is very nearly the same on the Pennsylvania, however, where the 12-cent rate would be equivalent to 30.9 per cent. of its actual average freight rate, against 30.3 per cent. on the Lake Shore and 26¼ on the New York Central.

Record of New Railroad Construction.

This number of the RAILROAD GAZETTE has information of the laying of track on new railroads as follows:

Cairo & Fulton.—Completed (with the exception of the bridge over Red River) by the laying of track from Fulton, Ark., southwest 18 miles to the Texas border and a junction with the Texas & Pacific at Texarkana. *Texas & Pacific.*—The *Transcontinental Division* has been extended eastward 6 miles to Brookston, Texas, 56 miles east of Sherman. *Galveston, Harrisburg & San Antonio.*—Extended from Schulenberg, Texas, west five miles to the West Navidad River. *Chicago & Northwestern.*—Three short branches of the *Peninsula Division* were constructed among the iron mines of Lake Superior last year, their aggregate length being 10 miles.

This is a total of 39 miles of new railroad, 23 miles of it completed this year. The only other section which we have reported as completed since the end of last year is 3 miles of the Elizabethtown & Paducah, so that the total completed in the United States in 1874 is 32 miles.

Railroad Construction in 1873.

Further corrections to our record published January 10 are as follows:

Elizabethtown & Paducah.—There were 12 miles more laid, on three different sections, than reported, 26 miles in all, on the *Louisville Extension*. The *Chicago & Northwestern* constructed the following short branches of the *Peninsula Division* in Michigan: The *Excelsior Mine Line*, 3 miles; the *Saginaw Mine Line*, 3 miles, and the *Loop Line*, 4 miles, in all 10 miles.

These make the length completed in 1873 in the United States 8,833 miles.

THE NATIONAL BOARD OF TRADE, at its session in Baltimore last week, received a report from its Committee on Transportation which was doubtless prepared by its Secretary, Mr. Wm. M. Grosvenor, of St. Louis, a gentleman who differs from most of those who discuss the transportation question, inasmuch as he understands the value of facts and knows pretty well how to use them. We have not seen his report, but the resolutions which it recommended were: 1. That railroad companies should be compelled by law to deliver the same quantity of grain in bulk which they receive. 2. That Congress should not now appropriate anything in aid of artificial means of transportatian. 3. That while railroads should be subject to the control of government and prevented from exercising unjust or arbitrary powers, it is inexpedient to fix rates by law. 4. That freight lines not owned by the companies over whose roads they run frequently lead to great abuses and are unadvisable. 5. That Congress should charter any railroad between the West and the seaboard whenever private capital is ready to construct it. 6. That the Executive Council of the Board memorialize the several State Legislatures in favor of the principles recommended in the other resolutions. All these except the fifth were adopted.

THE MEXICAN RAILWAY COMPANY which owns the railroad from Vera Cruz to the city of Mexico, with the branch to Puebla, in all 293 miles, has recently made its report for the half-year ending with June, 1873. For the first 22 days of that period a long section of the road was not yet opened for traffic. The receipts for the six months were $962,360, and the working expenses $557,490, or 58 per cent., the receipts per mile for the average mileage open for traffic (280 miles) being $3,467 for the half-year. Besides its 293 miles of railroad the company has 43 locomotives, a little more than 300 freight cars, and about 30 passenger cars, and the entire capital account is about $28,500,000, or $98,880 per mile. About one-fourth of the receipts are for passengers, and more than one-eighth for carrying *pulque*, the Mexican whisky. The whole freight carried weighed but 64,000 tons, about two-thirds of which seems to have been up the road towards the city of Mexico, indicating that the imports are much more bulky than the exports. The expenses per train mile were about $1.88.

THE NATIONAL CHEAP TRANSPORTATION ASSOCIATION held a convention in Washington last week at which delegates from fifteen States were present. Most of the speeches seem to have been in advocacy of some "great water route," and mainly for lines in the South, where they are least needed. The Railroad Committee reported in favor of the Government constructing a narrow gauge railroad from the West to the seaboard. The progress made by the Association towards the solution of its problem is hardly perceptible, which is a pity, for such a body might do a good work.

MARRIAGE would not seem to have any close connection with railroad traffic, but we find an officer of an East Indian railroad company explaining a falling off in the passenger receipts of the year by the fact that it was a "twelfth year," which is regarded by the Hindoos as so unfavorable to marriage that no one or scarcely any one is married. And as weddings are the great occasions in Hindoo life, when there is great pomp and a general gathering together of friends, they cause a great deal of traveling.

Transportation in Congress.

In the Senate on the 19th:

Mr. Mitchell, of Oregon, introduced a bill to provide for the construction of the Portland, Oregon & Salt Lake Railroad and Telegraph. Referred to the Committee on Railroads.

Mr. Ferry, of Michigan, introduced a bill authorizing the construction of a bridge across Detroit River at Detroit. Referred to the Committee on Commerce.

Mr. Ingalls, of Kansas, one to incorporate the Colorado Canal, Irrigation and Land Company. Referred to the Committee on Public Lands.

Mr. Ramsey, of Minnesota, one to authorize the Sioux City & St. Paul Railroad Company to construct a branch from Sibley, Iowa, to Yankton, Dakota. Referred to the Committee on Public Lands.

In the House on the 19th:

Mr. Page, of California, offered a resolution instructing the Committee on Public Lands to ascertain whether the lands granted by Congress to the Atlantic & Pacific Railroad Company, to aid in the construction of a railroad from Springfield, Mo., to the Pacific Ocean, are forfeited, and whether any legislation is necessary to restore such lands to pre-emption and homestead entry. Adopted.

Mr. Cotton, of Iowa, presented petitions of the Chicago, Clinton & Dubuque Railroad Company, the Chicago, Dubuque & Minnesota Railroad Company, and many citizens of Iowa, asking that the railroad bridge across the Mississippi River at Clinton, Iowa, be opened to the use of all railroads centering at that point that may desire to use the same. Referred to the Committee on Commerce.

In the Senate on the 20th:

Mr. Oglesby, of Illinois, presented a petition of the National Board of Trade in regard to increasing the facilities and cheapening the rates of transportation between the interior and the seaboard, asking for the improvement of the natural water routes, etc. He made comments in which he insisted upon the importance of the subject. Referred to the Committee on Transportation Routes to the Seaboard.

Mr. Bogy spoke on the same subject and believed that the most important work needed was the improvement of the great rivers of the Mississippi Valley, and especially of the mouth of the Mississippi.

Mr. Clayton, of Arkansas, called up a resolution instructing the Committee on Railroads to consider the expediency of reporting a bill providing for a general system of railroad incorporation. The resolution was referred to that committee.

Mr. Pratt, of Indiana, offered an amendment to the Post Route Bill declaring all bridges across navigable streams and all public railroads to be post routes.

Mr. Ramsey, of Minnesota, opposed this amendment, saying that it would legalize every bridge over the Mississippi and other rivers, and prevent Congress ordering their removal should they be found to obstruct navigation.

In the House, on the 20th:

Mr. McCrary, of Iowa, presented the report of the Committee on Railroads and Canals, recommending a bill to regulate commerce by railroad among the several States. Ordered to be printed and recommitted.

This bill provides for the regulation of passenger and freight charges by a commission of nine members, to be appointed by the President, whose terms of office shall be two, four and six years, and their salaries $4,000 a year.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

— The notice, in the number for January 3, of the appointment of Mr. J. W. Pillsbury to the position of General Passenger Agent of the Ohio & Mississippi Railroad, was an error. We are informed that Mr. R. T. Brydon still continues General Passenger Agent of the road, and that there is not likely to be any change in that office.

— At the annual meeting of the Philadelphia & Reading Railroad Company in Philadelphia, January 12, the old officers were all re-elected, as follows: President, Franklin B. Gowen; Managers, John Ashurst, A. E. Borie, R. B. Cabeen, J. B. Lippincott, H. Pratt McKean and Charles E. Smith, all of Philadelphia; Treasurer, Samuel Bradford; Secretary, David J. Brown.

— At the annual meeting of the Wilmington & Reading Railroad Company at Coatesville, Pa., January 13, the following directors were chosen: Edward Betts, George W. Bush, Irene Dupont, Victor Dupont, E. C. Stotsenberg, Joseph Tatnall, Wilmington, Del.; Charles Huston, C. E. Pennock, J. S. Pennock, S. B. Worth, Coatesville, Pa.; Edward Brook, Birdsboro, Pa.; Heister Clymer, Reading, Pa.; Robert Frazer, Camden, N. J. The directors elected the following officers: President, Robert Frazer; Secretary and Treasurer, William S. Hilles; General Superintendent, C. Stolz. The only change is the election of Mr. Frazer, who until recently was President of the Camden & Atlantic Railroad Company, as President and a director in place of Hugh E. Steele.

—At the annual meeting of the Philadelphia, Wilmington & Baltimore Railroad Company in Wilmington, Del., January 12, the old board of directors was re-elected, as follows: Isaac Hinckley, Samuel M. Felton, William Sellers, Samuel Welsh, Philadelphia; Jesse Lane, Joseph Bringhurst, Samuel Harlan, Jr., Wilmington, Del.; Thomas Whitridge, Thomas Kelso, Thomas Donaldson, S. M. Shoemaker, Enoch Pratt, Baltimore; Jacob Tome, Port Deposit, Md.; Nathaniel Thayer, William Minot, Jr., Boston, Mass. The board re-elected the old officers, as follows: President, Isaac Hinckley; Vice-President, Enoch Pratt; Secretary and Treasurer, Alfred Horner; General Superintendent, H. F. Kenney.

—At the annual meeting of the Peach Bottom Railroad Company at Peach Bottom, Pa., January 12, S. G. Boyd was chosen President, with the following board of directors: Samuel Dickey, Sanders McCullough, William Wallace, A. C. Manifold, Robert B. Patterson, John A. Alexander, Slater B. Russell, Charles R. McConkey, Nathaniel Mayer, Michael Schall, Lewis W. Finley and Z. B. Loucks.

—At the annual meeting of the New York Elevated Railroad Company in New York, January 14, the following directors were elected: Danforth N. Barney, John P. Tracy, David Dows, F. H. Tows, Job H. Hall, W. L. Scott, W. L. Wallace, Ashbel H. Barney, James A. Cowing, A. S. Barnes, Daniel Torrance, Harvey Kennedy, John D. Mairs.

—Mr. Francis T. King has been chosen a director of the Baltimore & Ohio Railroad Company in place of Johns Hopkins, deceased. Mr. Galloway Cheston takes Mr. Hopkins' place as Chairman of the Finance Committee.

—Mr. E. R. Wadsworth, heretofore General Freight Agent, has been appointed General Agent of the Chicago, Burlington & Quincy Railroad, with office in Chicago. Mr. J. Q. A. Bean is appointed General Freight Agent, in place of Mr. Wadsworth, and Mr. E. S. Washburn is appointed Assistant General Freight Agent.

—The first board of directors of the Keokuk & Des Moines Railway Company (formed by the first-mortgage bondholders of the Des Moines Valley Railroad) is as follows: Henry A Barling, Theodore Gilman, Robert C. Geer, J. Augustus Johnson, Edward D. Mandell, William C. Nicoll, James Grant, O. C Hale and C. Seguine Johnson.

—Gen. Herman Haupt, the eminent engineer, has been appointed General Manager of the Richmond & Danville Railroad Company.

—At the annual meeting of the Pittsburgh, Virginia & Charleston Railway Company, in Pittsburgh, Pa., January 15, George V. Lawrence, Moses Thompson, Joseph Walton, William J. Howard, Henry B. Hays, J. C. Risher and Alex. Patton were chosen directors. John Scott was elected President, and B. F. Jones, Vice-President.

—At the annual meeting of the Terre Haute & Indianapolis Railroad Company, January 13, W. K. Edwards, Alexander McGregor, William R. McKeen, J. H. Hager, D. W. Minshall and F. C. Crawford, of Terre Haute, Ind., and Josephus Collett, of Newport, Ind., were re-elected directors. The board re-elected the old officers for the ensuing year, as follows: President, W. R. McKeen; Treasurer, R. A. Morris; Secretary, W. H. Buckingham; Auditor, M. S. Durham; General Superintendent, John E. Simpson; Superintendent of Motive Power, Charles R. Peddle; General Freight Agent, H. W. Hibbard; General Passenger Agent, Charles E. Follett; Paymaster, J. H. Hager.

—Mr. C. A. Swineford, for some time past Train Dispatcher on the Wisconsin and Milwaukee divisions, has been appointed Assistant Superintendent of the Madison Division of the Chicago & Northwestern Railway, with office at Baraboo, Wis. Mr. John H. Hull, late of the West Wisconsin, has been appointed Train Master of the Madison Division.

—Mr. Alfred Hocking has been appointed Freight Agent in Boston for the Vermont Central Line, Mr. T. Edward Bond is appointed Ticket Agent in Boston for the same line, and Mr. F. L. Parker, Chief Clerk.

—Mr. William H. Wallace, for many years a conductor on the New York, New Haven & Hartford road, has been appointed Superintendent of the New York and Boston through lines, in place of Mr. James Parker, deceased.

—At the annual meeting of the New York, New Haven & Hartford Railroad Company in New Haven, Conn., January 14, the old board of directors was re-elected, as follows: William D. Bishop, Nathaniel Wheeler, Bridgeport, Conn.; E. C. Read, E. H. Trowbridge. New Haven, Conn.; William P. Burrall, Henry C. Robinson, C. M. Pond, Hartford, Conn.; Chester W. Chapin, George B. Carhart, George M. Miller, Springfield, Mass.; Wilson G. Hunt, Augustus Schell, A. R. Van Ness, Cornelius Vanderbilt, New York. Henry C. White, Charles Boswell and William Vermilyea were chosen auditors for the ensuing year.

—At the annual meeting of the Troy & Boston Railroad Company, January 13, the following directors were re-elected for the ensuing year: Harrison Durkee, New York; Lyman Wilder, Hoosic Falls, N. Y.; Amos Briggs, Schaghticoke, N. Y.; D. F. Vail, Daniel Robinson, Jonas C. Heartt, Jared S. Weed, Joseph W. Fuller, Hiram Miller, Sylvander Johnson, John H. Willard, Cornelius L. Tracy, Samuel M. Vail, Troy, N. Y.

— At the annual meeting of the St. Louis, Vandalia & Terre Haute Railroad Company, at Greenville, Ill., January 13, the following directors were elected: J. F. Alexander, A. G. Henry, R. L. Dulaney, Greenville, Ill.; J. S. Peers, Collinsville, Ill.; Otto Brodtbeck, Highland, Ill.; William K. Edwards, Terre Haute, Ind.; William P. Shinn, Pittsburgh, Pa.; Thomas A. Scott, George B. Roberts, Philadelphia. The only new director is Mr. Dulaney, who replaces John Schofield. The board re-elected the old officers, as follows: George B. Roberts, President; Williamson Plant, Secretary; William P. Shinn, Treasurer. The road is operated by the Terre Haute & Indianapolis Company, forming, with that company's road, the Vandalia Line from Indianapolis to St. Louis.

— Judge James Baker has been chosen President of the Memphis, Carthage & Northwestern Company, in place of L. P. Cunningham.

— The first board of directors of the Des Moines & Fort Dodge Railroad Company is as follows: John L. Ludlum, T. C. M. Paton, David E. Green, Charles Dana, George Bliss, George B. Smythe, Charles E. Whitehead, New York; John A. Elliott, C. C. Nourse, Des Moiness Ia.

— Gen. Robert F. Stockton, of Trenton, N. J., has been appointed Receiver of the New Jersey Southern Railroad. He is a director of the company.

—At the annual meeting of the Utica, Clinton & Binghamton Railroad Company in Utica, N.Y., January 19, John Thorn, Andrew W. Mills, Isaac Maynard, David M. Miner, O. S. Williams, J. W. Forward, Robert S. Williams, N. W. Parker, J. E. Elliott, George B. Phelps, Henry Hopson, Alex. Holland and Henry S. Armstrong were re-elected directors. The board subsequently re-elected O. S. Williams, President; Isaac Maynard, Vice-President, and J. W. Church Secretary, and appointed O. S. Williams, Isaac Maynard and A. W. Mills, executive committee; J. E. Elliott, R. S. Williams and H. S. Armstrong, committee in charge of street roads.

—At a meeting of the board of directors of the Western Maryland Railroad Company in Baltimore, January 14, Mr. Alexander Rieman, for some time past President *pro tem.*, was chosen President of the company. Mr. John H. Hood was chosen Vice-President and General Superintendent.

— Mr. P. L. Cable has been elected President of the Canada Southern Railway Company in place of Milton Courtright, resigned. Mr. Cable has been, since the last election, a director of the Toledo, Wabash & Western Company.

— At the annual meeting of the Wilmington & Western Railroad Company in Wilmington, Del., January 12, the following

directors were elected: George G. Lobdell, Joshua T. Heald, Job H. Jackson, William H. Swift, George Springer, William G. Phillips, Howard M. Jenkins, Martin Landenberger, James Bradford.

TRAFFIC AND EARNINGS.

—The earnings of the St. Louis & Southeastern Railway for the month of December were: 1873, St. Louis Division, $56,624.42, Nashville Division, $39,717.41, total, $96,341.89; 1872, total, $72,309.30; increase, $24,032.59, or 33¼ per cent.

—The coal tonnage of the Central Railroad of New Jersey for the year 1873 was 2,466,079 tons. Of this 1,348,694 tons went to Port Johnston for shipment, 948,252 tons to Elizabethport, and 169,133 tons to way stations.

—The earnings of the Pittsburgh, Virginia & Charleston Railroad for the year 1873 were $52,164.95; expenses, $41,558.15; net earnings, $10,606.80 The road carred 140,788 passengers, and 56,328 tons of freight.

—The earnings of the Great Western Railway of Canada for the week ending December 26 were: 1873, £23,439; 1872, £14,949; increase, £8,490, or 56¼ per cent.

—The earnings of the Grand Trunk Railway for the week ending December 27 were: 1873, £32,500; 1872, £21,700; increase, £10,800, or 49¾ per cent.

—The earnings of the North Pennsylvania Railroad for the year ending October 30, 1873, were:

Earnings ($20,521 per mile)	$1,477,540
Expenses (63 per cent.)	931,573
Net earnings ($7,583 per mile)	$545,967

—The Utah Central road carried during the year 1873, 144,461 tons, or 14,446 car-loads of freight. Of this, 53,763 tons was coal and coke; 22,383 tons, ore and bullion; 12,934 tons, lumber; and 6,445 tons, iron ore.

—The Utah Southern Railroad carried 78,545 tons of freight during the year 1873. Of this, 29,891 tons was ore and bullion; 15,649 tons, coal and coke; 5,116 tons, charcoal; and 7,106 tons, iron ore and limestone.

—The earnings of the Queen Anne's & Kent Railroad for the year 1873 were $14,374.92, or $553 per mile. The earnings of the Townsend Branch, leased and worked jointly by the Queen Anne's & Kent and Kent County companies were $19,802.18, or $1 980 per mile.

—In a recent letter to the New York *Times*, Mr. Israel T. Hatch, of Buffalo, says:

"Nearly all the Western commerce which enters Buffalo finds its way to our metropolitan city by the Erie Canal or by railways. The Western imports at Buffalo, therefore, furnish the standard by which the loss or gain of the Western trade may be accurately measured, and the capacity of our carrying systems to transport the Western crop to the seaboard ascertained. Reducing flour to wheat, the total grain receipts at Buffalo for 1873 were 101,062,120; reduced to tons, 3,400,000, according to the tables of the Buffalo *Commercial Advertiser*. Total receipts of grain estimated as before, at Chicago, Milwaukee, Duluth, Detroit, Cleveland and Toledo, were 168,047,903; reduced to tons, 5,041,400. From this it will be seen that almost two-thirds of the Western trade still comes to our State, and this is accomplished through the agency of the Erie Canal, only worked by mules during seven months in the year, and through 'a single lock canal.'"

—The earnings of the St. Louis & Southeastern (consolidated) for the first week of January were: 1873, $17,486.63; 1874, $24,794.23; increase, $7,307.60, or 42 per cent.

—The earnings of the Western Maryland Railroad for the fifteen months ending September 30, 1873, were:

Earnings ($3,143 per mile)	$254,585.71
Expenses (90 per cent.)	229,040.88
Net earnings ($315 per mile)	$25,544.83

—The earnings of the Wilmington & Western Railroad for the year ending October 31, 1873, were:

Gross earnings ($1,761 per mile)	$35,219.24
Operating expenses and taxes	38,082.61
Deficiency	$2,263.37

For the last half of the year the earnings exceeded expenses by $5,181.79, the deficiency being in the first half-year.

—The earnings of the Rockford, Rock Island & St. Louis Railroad for the month of September, 1873, were $87,261.69; the working expenses, rents and taxes, $61,605.75; the net earnings, $25,655.94.

CHICAGO RAILROAD NEWS.

The Commissioners Freight Schedules.

All the railroad companies in Illinois, so far as is known here, have determined to entirely ignore the freight and passenger tariffs prepared by the Illinois Railroad Commissioners. The rates were supposed to take effect Jan. 15, and this would put the railroad companies of the State and the law-making authorities of the same into square opposition. But sundry members of the Legislature claim that the schedules were not to become effective until enacted by the Legislature, and the railroad companies believe they can manage their own business better than the State or the State's agents; and claim that to yield obedience to the Railroad Commissieners in this matter of rates would be but to permit the practical destruction of railroad values. The question rests with the courts. It is expected that prosecutions will soon commence upon the basis of the new schedules, which will be defended up to the courts of last resort, if necessary, and when the result is determined, the important question will undoubtedly be solved as to how far the State can regulate railroad corporations.

Illinois Central.

The business of this company is slowly but steadily improving, and as soon as the public begin to be aware of the advantages of the new through route to the Gulf, by the Mississippi Central Extension at Cairo, a new impetus is expected to the direct trade between Chicago and the South.

Chicago, Burlington & Quincy.

This company reports an unusually good business. The receipts are considerably above those of the same time last winter. Grain, stock and hogs continue to arrive over this route in large quantities.

Chicago & Northwestern.

The reports of a consolidation of this company and the Milwaukee & St. Paul turn out to have been founded on an agreement for the use of each other's tracks on a definite basis. The Milwaukee & St. Paul is to have the privilege of running its St. Paul trains over the La Crosse, Trempeleau & Prescott road owned by the Northwestern and its bridge at Winona, from the junction near La Crosse to Winona; and the Northwestern has the right to dispatch freight bound from points west of Madison to Milwaukee over the Milwaukee & St. Paul from Madison to Milwaukee at a fixed and moderate charge for haulage. The contract is for five years, but terminable by either party on giving 30 days' notice. By this the Milwaukee & St. Paul is able to dispense with a bridge or ferry at La Crosse, but also cannot use the River Division below Winona for through traffic. The Northwestern is enabled to direct shipments from a large part of its system to Milwaukee, which enables shippers to choose between the two great lake markets.

This company has made arrangements to build at Milwaukie an elevator with a storage capacity of 500,000 bushels of grain. An arrangement has been made with Mr. Angus Smith, who has had charge of the Milwaukee & St. Paul elevators for some time, to manage the Northwestern elevator, or elevators, for the new one is to be the first of several.

Burning of Union Depot.

The great passenger depot on the lake shore at the foot of Lake street, occupied by the Michigan Central, Illinois Central and Chicago, Burlington & Quincy companies, was destroyed by fire on the morning of the 20th, together with several coaches belonging to these companies and the Pullman Palace Car Company, and a considerable amount of passenger's baggage in the main baggage room. This depot was destroyed in the great fire of 1871, but was rebuilt without a very large expenditure, as the walls remained. It was a very large building, but utterly inadequate to the needs of the companies, which have only waited to get possession of the ground a little further south to begin the construction of a much larger structure. It can be made to serve again by constructing a new roof, and the companies will hardly be willing to rebuild it entirely, as it cannot possibly be made to accommodate them permanently.

Chicago & Pacific.

In reply to reports published in some newspapers that the contractors for the extension west of Elgin had failed, that there is no probability that the extension will be completed, that the road runs but one train a day between Chicago and Elgin, and that it does not begin to pay expenses, Mr. George H. Daniels, the General Freight and Ticket Agent, writes to the Chicago *Tribune* that the company is running three trains each way daily between Chicago and Elgin, that for November and December the working expenses were less than 70 per cent. of the receipts, and that the passenger receipts in October were more than $100 per mile. He adds: "Our depot in Chicago is not in a very convenient place, but we expect early in the spring to have as central a location as almost any road running out of the city. Our road west of Elgin is nearly all graded to Byron, 50 miles, and the ties are on our docks in Chicago, awaiting Spring to be laid. We have built up the finest suburban passenger business ever secured by any company in the same length of time, and our business is increasing every month, as our records will show."

OLD AND NEW ROADS.

Grand Tower & Carbondale.

This road, which is owned by the Grand Tower Mining, Manufacturing & Transportation Company, together with all the mines, lands and other property of the company, is to be sold under foreclosure of two mortgages. One of these mortgages is for $500,000, and the interest on the bonds is in default since February 1, 1871; the other mortgage is for $1,000,000, with interest in default since November 1, 1870. The sale is to take place in New York, March 14. The road is 28 miles long, from Grand Tower, on the Mississippi River, east to the Illinois Central at Carbondale. The company also owns a large amount of coal property.

Cincinnati & Great Northern.

This company has recorded a mortgage for $13,000,000 to the Farmers' Loan & Trust Company of New York, on its projected road from Cincinnati to Lake Huron in Presque Isle County, Mich.

Davenport & St. Paul.

It is now proposed that the City of Davenport shall build a track into the city along the river bank and grant the use of it to this company, on condition that the repair shops of the road are built in Davenport.

Des Moines & Minnesota.

Tracklaying was commenced at Des Moines, Ia., January 12.

Mississippi Valley & Western.

A large force of tracklayers is at work between West Quincy, Mo., and Hannibal.

Gilman, Clinton & Springfield.

The Receiver has discontinued all passenger trains, and freight and mixed trains alone are now running. The people along the line are said to be much dissatisfied with the Receiver's management.

Rahway.

The company organized by this name last Winter having expired under the limitation of the law, a new company by the same name has been organized. The road is to be four miles long, from Rahway, N. J., northeast to a junction with the New York & Long Branch. The capital stock will be $50,000.

Richmond & Chesapeake.

The track through Richmond, Va., connecting this road with the Richmond & Danville, is completed. A new steamer has been put on the line from West Point to Baltimore.

Wilmington & Reading.

Three locomotives and 40 freight cars have been added to the equipment. A shop has been built at Coatesville, Pa., and fitted up with the necessary tools.

Walla Walla & Columbia River.

We are indebted to Mr. O. W. Gray, a map publisher of Philadelphia, for a second correction of our statement of the situation of this road. Learning that it was in Washington Territory we made two assumptions, both of them erroneous. The first was that it was on the right bank of the Columbia, and the second that it extended northward from the river. The fact is that in longitude about 42 west of Washington the Columbia first turns westward, its course above that point for a long distance being from the northwest; and Washington Territory extends about 75 miles further east, so that both banks of the Columbia are in Washington above this bend. The railroad leaves the river but a very few miles above this bend and north of the Oregon border, and extends nearly due east up the little Walla-Walla River towards the Blue Mountains.

Cleveland, Columbus, Cincinnati & Indianapolis.

Those stockholders who are opposed to the lease of this road to the Atlantic & Great Western are requested to send their proxies to Leland, Bros. & Co., 19 Nassau street, or to J. & S. Ferguson, No. 35 Pine street, New York. It has been understood that the Atlantic & Great Western has actual possession (in trust, we believe) of a majority of the shares.

New York, Housatonic & Northern.

A party of engineers in charge of Mr. Frank Somes on the 20th began work on the line of this road toward Danbury.

Wilmington & Western.

At the annual meeting in Wilmington, Del., January 19, it was stated that the amount of capital stock paid in was $248,807.50, the funded debt $500,000 and the floating debt $91,598.74. The stockholders rejected the proposition made by the bondholders, and adopted a plan which is to be submitted to the bondholders and other creditors. By this plan the coupons on the bonds up to July 1, 1879, and the floating debt are to be paid by an issue of scrip, redeemable hereafter in first-mortgage extension bonds to be issued on the extension from Landenberg to Oxford. The coupons and the evidences of floating debt to be held by the trustees of the mortgage in trust, and to be returned to the owners in case the extension bonds are not issued by October 1, 1876.

Lowell & Andover.

The contractors for the grading have commenced work. The contracts for masonry and bridging are not yet let.

New Jersey Southern.

The strike on this road still continues and travel on it is altogether stopped. The main cause of the strike appears to have been the fear of the men that they would lose the three or four months' back pay due, as the trustees for the bondholders who now hold the road have declined to pay any arrears of wages. There is also a Receiver, Gen. R. F. Stockton, of Trenton, N. J., who was appointed recently by the Court of Chancery, but his authority was not sufficient to arrange the matter. No damage has been done to any of the property, except the taking up of a few rails, enough to prevent the locomotives from being taken away from Manchester, where they were taken and housed by the strikers. Gen. Stockton has applied to the court for authority to run the road and to arrange for payment of back wages, which will probably be granted.

Cairo & Vincennes.

Application has been made by a stockholder to the United States Circuit Court at Springfield, Ill., for the appointment of a Receiver. The petitioners are Messrs. Winslow & Wilson, the contractors, who say that there is now due to them fifteen months' unpaid interest amounting to $144,375. Including the first and second-mortgage bonds, the railroad company owe $6,343,250. The earnings are not sufficient to pay the operating expenses, and there is, therefore, nothing left to pay the interest on the bonds.

Western Maryland.

The Mayor of Baltimore in his annual message gives the following statement of the capital account of this company, in which the city has a large interest:

First mortgage, of which $200,000 is indorsed by city	$600,000
Second preferred mortgage	600,000
Second mortgage, $300,000 indorsed by city and $300,000 by Washington County	600,000
Third mortgage, indorsed by city	875,000
Fourth mortgage to secure loan of city stock	1,000,000
	$3,675,000
Funded certificates	170,546
Overdue coupons, not funded	72,551
Coupons due city on second preferred bonds	61,000
Interest paid by city	465,000
Interest paid by Washington County	102,150
Total mortgage debt	$4,546,247
Deduct sinking fund	132,454
	$4,413,793
Capital stock	683,000
	$5,096,793

The funded debt and overdue interest thus amounts to $44,138 per mile, and the whole capital account to $50,968 per mile. The net earnings last year were only sufficient to pay interest on the funded certificates, but a large increase of business is hoped for from the extension to Williamsport.

Erie.

The mason work of the stone arch over Shohola Creek on the Delaware Division, which has been over a year in construction, is completed. The filling in and laying the track will not be completed until spring.

Delhi & Oneonta.

It is proposed to build a railroad from Delhi, N. Y., the terminus of the Midland's Delhi Branch, north and west to Oneonta, on the Albany & Susquehanna. The road would be about 18 miles long, and eight miles of it would be on the line of the New York, Kingston & Syracuse.

Montreal, Chambly & Sorel.

This company, which is building a railroad from Montreal southeastward to Sheldon, Vt., where it is to connect with the Portland & Ogdensburg, is about to ask a subscription of $250,000 from the city of Montreal. The road is in operation from St. Lambert, Quebec, to Chambly, on the Richelieu River, and work is progressing on the grading and also on the bridge over the Richelieu.

Rising Sun, Aurora & Hardinstown.

This company has filed its articles of association with the Secretary of State of Indiana. The road is to extend from Rising Sun, Ind., on the Ohio River, northward to a connection with the Indianapolis, Cincinnati & Lafayette, and will be about 15 miles long. The capital stock is to be $150,000.

Bangor & Calais Shore Line.

The directors of this company have accepted the survey of the line as made from Bucksport, Me., to Calais. The company will apply to the Legislature for permission to build a bridge over the Penobscot River at Bucksport.

Baltimore, Pittsburgh & Chicago.

The completed section of 62½ miles from Chicago Junction, O., on the Lake Erie Division of the Baltimore & Ohio, west to Deshler on the Dayton and Michigan, is now opened for business, and regular trains are running over it. For the present the road uses the bridge and depot of the Cincinnati, Sandusky & Cleveland at Tiffin, but a new bridge over the Sandusky River at that point is being built.

Jackson, Lansing & Saginaw.

In a suit arising from the cutting of timber on certain lands, the Michigan Supreme Court has given a decision which, it is said, practically decides the ownership of 7,000 acres of land claimed by this company in Bay County, Michigan. The lands in question were originally granted to the Amboy, Lansing & Traverse Bay Company, but the Jackson, Lansing & Saginaw subsequently built its road through them and laid claim to the land, on the ground that the other company had sold them before earning them. The Court has now decided in favor of the grantees of the old company.

Salisbury & Epping.

It is proposed to build a railroad from Salisbury, Mass., on the Eastern road, northwest to Epping, N. H., the crossing of the Concord & Portsmouth and Nashua & Rochester roads, a distance of about 20 miles.

Anderson, Lebanon & St. Louis.

A correspondent informs us that the grading from Anderson, Ind., to Noblesville is completed, except about $1,000 worth of work. The company has not paid the September and October estimates on account of some difference with the contractors, and the latter have brought suit to recover the amount they claim and have also suspended work. It is expected that the company will relet the contract and work will be resumed in the spring. Work on the grading in Boon County is progressing steadily, and a contract for a section near Valley City has been let to S. S. Eaton. The company claims that sufficient work has been done between Anderson and Noblesville to

entitle it to receive one-half of the 2 per cent. tax voted by the towns along the line. Steps have been taken to enjoin the tax in one township, but it is thought the effort will not be successful.

Nashville, Chattanooga & St. Louis.

This company has paid the State of Tennessee $1,170,000 in State bonds with the coupons from January 1, 1871, attached in full payment for the Nashville & Northwestern road, purchased from the State. One-half of this amount was not due until November, 1874. The company has also paid $364,260 in State bonds and past-due coupons, being in full of principal and interest of the State loan to the Nashville & Chattanooga Company. It has also deposited with the Comptroller $1,425,000 in first-mortgage bonds of the consolidated company to secure the redemption of the outstanding Nashville & Chattanooga bonds indorsed by the State of Tennessee.

Utah Northern.

Snow fences are being built at exposed parts of the road. There are rails enough on hand to complete the line to Franklin and also the southern extension from Brigham to Ogden.

European & North American.

A large amount of freight from Canada to New Brunswick and Nova Scotia, which was kept back by the early closing of the St. Lawrence, is now passing over this road, coming to it by the Grand Trunk and Maine Central.

Portland, Dalles & Salt Lake.

The Utah terminus of this projected road has been located at Corinne, on the Central Pacific, 24 miles west of Ogden.

Flint & Pere Marquette.

The sales of land during 1873 were 7,408 acres for $67,797, an average of $9.15 per acre. These are the lightest sales made in any year since sales were commenced. The total sales up to January 1, 1874, were 252,284 acres for $2,006,897, an average of $7.95 per acre.

Vermont & Canada.

A St. Albans (Vt.) dispatch reports that a compromise has been effected between this company and the Central Vermont. The terms are said to include the purchase of the Vermont & Canada road by the Central Vermont Company for $3,000,000, payable in twenty years, with interest at 6 per cent., secured by a first mortgage in trust.

Norwich & Worcester.

At the annual meeting, which was held in Worcester, Mass., January 14, a resolution was adopted authorizing the directors to borrow money and to purchase therewith all the stock of the Norwich & New York Transportation Company which they could legally hold. The latter company owns the steamboat line from New London to New York.

Boston & Maine.

It is proposed to build a branch from Oak Grove, northeast through Malden and Saugus to Lynn. This branch would be about seven miles long.

Marietta, Pittsburgh & Cleveland.

The stockholders of this company, at two special meetings held January 10 and 13, voted to increase the capital stock by $4,500,000 preferred stock, convertible into bonds, and also to issue $4,500,000 in 7 per cent. bonds, convertible into stock, and secured by a consolidated mortgage on the road.

Lancaster & Reading.

It is stated that negotiations are pending between this company and the Philadelphia & Reading. The latter company, it is said, will indorse and sell $150,000 of the other's bonds, with the proceeds of which the Quarryville Branch will be completed and then leased to the Philadelphia & Reading Company. If the agreement is made, the Quarryville line will be built of 4 feet 8½ inches gauge, instead of 3 feet, as now intended. It is also probable that the construction of the main line from Lancaster to Reading will be abandoned. The Quarryville Branch will be about 15 miles long, from Lancaster, Pa., southeast to Quarryville.

Taunton Branch.

At a meeting of the stockholders of the Taunton Branch Railroad Company, January 15, it was voted to accept the terms of consolidation offered by the New Bedford Company, and a committee was appointed to execute the agreement. The New Bedford Company is to assume all debts, and the Taunton Branch stockholders will receive four shares in the consolidated company for three of their old stock, or one share of new stock and $33.33 in money for each share of old stock. At the date of the last report the capital stock of the Taunton Branch Company was $500,000, and its floating debt exceeded the surplus by $38,000. There was no funded debt. The road is 11 miles long, from Taunton, Mass., to Mansfield, with a branch, nine miles long, to Attleboro.

Northern Pacific—Pacific Division.

Regular trains commenced running over the whole line from Kalama, W. T., to Tacoma, January 5.

Santa Cruz.

Eight miles of this narrow-gauge road are under contract, from Santa Cruz, Cal., to Aptos Creek, and the first section of five miles, from Santa Cruz to Soquel, is to be completed early in the spring.

Detroit, Eel River & Illinois.

It is reported that this company is negotiating for a lease from the Pittsburgh, Cincinnati & St. Louis Company of the road from Logansport, Ind., westward to the Illinois State line. This line is 61 miles long, and is continued westward from the State line by the Toledo, Peoria & Warsaw. It is the only eastern outlet of the latter road.

Valley, of Virginia.

The City Register of Baltimore paid to the Treasurer of this company, January 19, a further installment of $60,000 of the city's subscription. This makes $600,000 in all paid, the whole subscription being $1,000,000.

Jersey Shore, Pine Creek & Buffalo.

A correspondent informs us that work on the grading of this road is progressing as rapidly as circumstances will permit. The working force is at present concentrated on several miles of very heavy work along the West Branch Canal. This work is all rock cutting, requiring heavy blasting, and must be completed before the water is let into the canal in the spring. Work on the balance of the road is to be pushed in the spring.

Springfield & Tariffville.

The project of building a railroad from Springfield, Mass., south by west to Tariffville, Conn., about 15 miles has been revived, with some prospects of success. At Tariffville connection would be made with the Connecticut Western and New Haven & Northampton roads, thus giving Springfield a new line to the west and to Hartford, and a new connection with New Haven.

Des Moines and Fort Dodge.

The second-mortgage bondholders of the Des Moines Valley road, who bought the section from Des Moines to Fort Dodge at the recent sale, have organized a company under this name. The new company is to issue $1,000,000 of 7 per cent. preferred stock, and $2,000,000 of common stock. The preferred stock is to be issued for cash or past-due coupons on the old bonds, and the common stock for the purchase of the road. There is also to be an issue of $2,400,000 in bonds, one-half coupon and one-half registered, the interest on the latter to be paid only after payment of running expenses, taxes and interest on the coupon bonds. These bonds are to be exchanged for the old Des Moines Valley bonds, one new bond for two old ones. The directors have authority to lease the road.

Palisade & Eureka.

The bridge over the Humboldt River at Palisade, Nev., is up and the grading is completed for 10 miles southward. A locomotive and some iron has been received, and track-laying will be commenced as soon as the weather will permit.

Philadelphia & Reading.

The strike of the miners in the Schuylkill region has caused an almost complete suspension of coal traffic. A large number of train hands and some 400 of the men in the Reading shops have been discharged, or suspended.

New York, New Haven & Hartford.

At the annual meeting some of the stockholders raised objections to the lease of the Harlem River & Portchester road, mainly on account of its heavy cost, about $180,000 per mile. The President stated that the lease was necessary in order to prevent the construction of a competing line, and after some discussion the matter was dropped.

Keokuk & Des Moines.

By the articles of incorporation of this company, organized by the first-mortgage bondholders of the Des Moines Valley road, the capital stock is to be $3,924,600. Of this $2,500,000 is to be issued within a year, either for cash or for purchase of the road. The remaining $1,424,600 is to be issued within two years.

New Mail Route.

Mail service has been ordered over the Madison Division of the Chicago and Northwestern Railway from Elroy, Wis, to Winona Junction, 57 miles.

Meetings.

The annual meeting of the Galveston, Houston & Henderson Railroad Company of 1871 will be held in Galveston, Tex., January 27.

The annual meeting of the Toledo & St. Louis Air Line Railroad Company will be held in Crawfordsville, Ind., February 4.

The annual meeting and election of the Union Pacific Railroad Company will be held March 12.

Dividends.

The Delaware & Hudson Canal Company has declared a dividend of 5 per cent., payable February 2. Transfer books are closed from January 21 to February 5.

The Terre Haute & Indianapolis Railroad Company has declared a dividend of 5 per cent., payable February 2.

New York, Norfolk & Charleston.

The office furniture and other property of this company in Norfolk, Va., was recently sold at sheriff's sale to meet some small claims.

Knoxville & Ohio.

It is proposed to extend this road (which is now in operation from Knoxville, Ky., northward 35 miles to Careyville) from Careyville to Chitwood, a distance of some 30 miles, to connect with the Cincinnati Southern, at the latter place.

Northeastern, of Georgia.

It is stated that the grading of 38 miles of this road, from Athens, Ga., northward to the crossing of the Atlanta & Richmond Air Line is nearly completed. Surveys are being made from the Air Line road northward to Rabun Gap, and arrangements are made to let the contracts for that section as soon as the surveys are finished.

Atlantic, Mississippi & Ohio.

The bondholders resident in New York have held a meeting and appointed a committee to confer with the bondholders in Baltimore as to the best course to be taken with respect to the offer made by the company to fund the January coupons.

Galveston, Harrisburg & San Antonio.

Track is laid to the West Navidad River, six miles beyond Schulenberg, the late terminus, and 30 miles from Columbus. The bridge over the West Navidad is up, and the road is graded for 19 miles further.

Texas & Pacific.

Track is laid on the Trans-continental Division to Brookston, 56 miles east of Sherman, and within eight miles of Paris.

A large freight depot and platforms have been put up at Shreveport, La.

Old Colony.

This company petitions the Massachusetts Legislature for permission to consolidate with itself the Middleboro & Taunton Railroad Company, and also for leave to hold stock in steamboat lines.

St. Louis & St. Joseph.

At the request of a large proportion of the bondholders, represented by the committee appointed at a recent meeting, the foreclosure sale has been postponed from January 15 to February 18.

Dayton & Union.

An information in *quo warranto* has been filed in the Ohio Supreme Court to oust the present (recently elected) board of directors. The applicants claim that at the recent election several thousand votes were illegally rejected, and other votes were received that should have been rejected. The board elected was in the Atlantic & Great Western interest. The road is 47 miles long from Dayton, O., northwest to Union, and is now operated by Mr. J. H. Devereux, as trustee.

Cincinnati, Lafayette & Chicago.

Under the agreement of consolidation the Indianapolis, Cincinnati & Lafayette Company will take possession of this road February 1.

Canada Southern.

Contracts have been made for 600 additional freight cars, to be delivered at the rate of 20 per day.

New York & Oswego Midland.

Holders of the first-mortgage bonds are requested to send their addresses, with the amounts of their holdings, to Alexander & Green, solicitors for the trustees, No. 120 Broadway, New York.

Grand Trunk.

This company is having the new passenger equipment for the part of the road west of Montreal (recently changed to standard gauge), fitted with the Westinghouse brake.

Minnesota State Railroad Bonds.

The long contested case of the validity of the bonds issued by the State of Minnesota to sundry old railroad corporations, whose property was afterwards transferred to companies running the existing railroads of Minnesota, has recently been decided in the United States Circuit Court in Minnesota, by Judge Dillon. It had been contended that the bonds were a lien against the present railroad companies, but Judge Dillon decides that they are not; that the bonds issued (under an amendment to the State constitution of April 15, 1858) were legally issued and are valid and binding against the State itself; and that if suit could be brought against the State, the payment of these bonds by it could be enforced. He also pertinently added that "a State with such a future before it as the State of Minnesota cannot afford to bear the odium of repudiation." The case will probably be taken to the Supreme Court, but there is hardly a doubt that it will affirm Judge Dillon's decision. The suit was brought by Selah Chamberlain, who holds $500,000 of the bonds. There is a very strong feeling in the State against paying the bonds, caused by the fact that scarcely anything was received for them, the people not sufficiently appreciating the fact that a man must pay his notes even if he made a wretched bargain when he gave them.

Elizabethtown & Paducah.

We are indebted to Mr. John McLeod, the Chief Engineer, for an exact statement of the mileage completed at the close of 1873. It was from Louisville southward 3 miles, from West Point (on the Ohio River, about 25 miles by river below Louisville) northward 11 miles, from the junction with the main line at Cecilia northward 12 miles; total, 26 miles. This is 12 miles more than are reported.

Lake Shore & Michigan Southern.

The following is a summary of the company's report to the State Engineer and Surveyor of New York for the year ending September 30, 1873:

The capital stock as per charter, of which all is issued, is $50,000,000, and the bonded debt for 1872, $24,804,000, and for 1873, $29,095,000. The floating debt by the report of 1872 was $3,903,472.42, and for 1873, $4,754,193.70, showing an increase of $5,141,721.28 during 1873 in bonded and floating debt. The average rate of interest on the funded debt is 7 per cent. The cost of the road, including graduation and masonry, superstructure, land and buildings, is $62,694,703. The equipment is given at $13,238,222. The length of road is 540 miles main line, and the length of double track, including sidings, 568 miles; the length of branches owned by the company, 595 miles. The gross receipts for the year were $19,355,335.34, against $17,591,629.46 in 1872. The transportation expenses, including operating and repairs, were $13,487,927.08. The amount paid for interest and leases was $2,310,850. The dividend on stock is $4,008,630. The balance to credit of income account is given at $936,787.23. Included in the above expense account is the cost of substituting steel for iron rails.

The earnings for 1872-73 are at the rate of $17,053 per mile, the expenses 69 2-3 per cent., the deficit in net earnings below interest and dividends (two 4 per cent. dividends were paid in that year), $452,072.

The following is given as an approximate statement of the business for the year 1873, which is the company's fiscal year:

Gross earnings	$19,300,000
Operating expenses and taxes (70 per cent)	13,510,000
Net earnings	$5,790,000
Interest	2,140,000
Total	$3,360,000
August dividend (4 per cent.)	2,004,000
Balance	$1,356,000
Amount expended on construction and equipment account	3,587,000
Floating debt December 31, 1873	5,032,000

This makes earnings and expenses nearly identical with those for the year ending with September, and the only additional information is that concerning expenditures for new construction and the amount of the floating debt. This latter is nearly equal to a year's net earnings, but is almost wholly for new construction, and so represents new capital on which the company should be able to add to its net earnings.

At a meeting held on the 17th the directors voted to omit the usual half-yearly February dividend of 4 per cent. The list of the loan of 10-year sinking-fund 7 per cent. bonds was closed out January 15. Part of it was sold last spring; but about the time of the death of the late President it was withdrawn from the market, and was put on again only a little before Christmas, first at 87½ and lately at 90.

Milwaukee & St. Paul.

This company has outstanding now five or six different kinds of bonds, representing $26,265,000 mortgaged indebtedness and $245,000 of income bonds. At a meeting of the directors on the 17th, it was proposed to make a consolidated mortgage on the whole property for $35,000,000, to exchange for all the present bonds of every class, to provide steel rails and to build two bridges across the Mississippi River. The net earnings of this year will be sufficient, it is believed, for a 7 per cent. dividend on both preferred and common stock, and it is proposed to pay both in these bonds. The company has now 140 miles of steel rails laid. There is little or no construction of new lines necessary now to complete the company's system, and the annual large expenditures on construction account, which have prevented dividends on the common stock, can hereafter be devoted to improvements which will permanently reduce expenses, and to dividends.

St. Louis & Southeastern.

The November coupons, which the company were unable to pay when due, were paid promptly January 15, in accordance with the company's announcement made last month. This is the first railroad resumption since the panic.

Western Railroad Association.

This Association must not be confounded with the late "Western and Southern Railway Association," now transformed into the "Railway Association of America;" for it is much older, and is almost exclusively confined to the consideration and prosecution of patent cases, answering pretty nearly to the "Eastern Railroad Association," which has its headquarters just now in Springfield, Mass.

The Western Railroad Association held a session in Chicago last week and elected the following Executive Committee: Robert Harris, General Superintendent Chicago, Burlington & Quincy Railroad; Charles Paine, General Superintendent Lake Shore & Michigan Southern; George Jerome, Solicitor Detroit & Milwaukee; J. C. McMullin, General Superintendent Chicago & Alton; H. E. Sargent, General Superintendent Michigan Central; H. H. Porter, General Manager Chicago & Northwestern; John W. Cary, General Solicitor Milwaukee & St. Paul; S. F. Withrow, General Solicitor Chicago, Rock Island & Pacific, and John Newell, President Illinois Central. Mr. Robert Harris was re-elected President, and George Willard Secretary and Treasurer for the enguing year. An assessment for $60,000 to prosecute the various patent suits now in the courts was also ordered.

Arrest of Violent Strikers.

Eight men, one of them an engineman and all the rest firemen, have been arrested charged with being concerned in attempts to disable engines and attempts to throw trains from the track on the Little Miami Railroad. Three of them made a confession.

Cairo & Fulton.

The extension from Fulton, Ark., to Texarkana, 18 miles, was completed January 15. This makes the whole length of the road from the St. Louis & Iron Mountain at Moark to the Texas & Pacific at Texarkana, 303 miles, the only portion of the road incomplete being the bridge over Red River at Fulton.